Series 1933 Number 1

UNITED STATES DEPARTMENT OF AGRICULTURE

Soil Survey

of

Lee County, North Carolina

By

S. O. PERKINS
United States Department of Agriculture, in Charge
and
E. F. GOLDSTON
North Carolina Department of Agriculture
and North Carolina Agricultural Experiment Station

Bureau of Chemistry and Soils

In cooperation with the
North Carolina Department of Agriculture and the
North Carolina Agricultural Experiment Station

For sale by the Superintendent of Documents, Washington, D. C. - - - - - - - - - Price 30 cents

BUREAU OF CHEMISTRY AND SOILS

HENRY G. KNIGHT, *Chief*
W. W. SKINNER, *Assistant Chief*
F. L. TEUTON, *Editor in Chief.*

SOIL SURVEY

CHARLES E. KELLOGG, *in Charge*
W. E. HEARN, *Inspector, District 2*
J. W. MCKERICHER, *in Charge Map Drafting*

COOPERATION

NORTH CAROLINA DEPARTMENT OF AGRICULTURE

W. A. GRAHAM, *Commissioner*

and

NORTH CAROLINA AGRICULTURAL EXPERIMENT STATION

R. Y. WINTERS, *Director*
C. B. WILLIAMS, *in Charge Soil Survey*

CONTENTS

SOIL SURVEY OF LEE COUNTY, NORTH CAROLINA

By S. O. PERKINS, United States Department of Agriculture, in Charge, and E. F. GOLDSTON, North Carolina Department of Agriculture and North Carolina Agricultural Experiment Station

INTRODUCTION

Lee County is in a section where the rainfall is high and the mean annual temperature moderate, with hot summers and mild winters. Climatic conditions are favorable for general farming and for the production of such special crops as cotton, tobacco, peaches, dewberries, and vegetables. The winters are sufficiently mild for growing cover crops.

This county is located in two physiographic provinces—the piedmont plateau and the coastal plain. The original level upland of these two provinces has been considerably dissected by streams, and the resultant relief is that of rather broad and smooth interstream areas and well-rounded slopes which become steep and somewhat broken near some of the drainageways.

The piedmont plateau is one of the oldest physiographic provinces in the United States and is underlain by Triassic sandstone and shale, Carolina slates, crystalline schists, and granitic rocks. The coastal-plain province is of more recent age and is underlain by unconsolidated sand, sandy clay, and clay. The soils of the county, through soil-building processes, have been formed from the weathered products of these geologic formations.

The county lies within a belt designated in the United States as the Red and Yellow soils belt which includes the mid-Atlantic section of the United States. The piedmont-plateau part of the county, before it was occupied by man, was covered with forest consisting mainly of oaks and pines, and the coastal-plain part supported a forest mostly of longleaf pine.

The soils are naturally well drained except in flats and depressions on terraces and first bottoms along streams. The well-drained soils are more or less leached in the surface layers, and, owing to this condition, these layers contain less plant nutrients than the subsoil layers. Soil leaching is greatest in the soils of the coastal-plain section because of the sandy texture and open structure of the soils. In addition to their leached condition the soils of the county as a whole are very low in organic matter, and therefore humus, one of the important soil constituents, is lacking. The surface soils of a large proportion of the soils in the piedmont plateau are shallow because of serious erosion, and this condition has considerably reduced their natural fertility. All the soils are more or less acid.

The well-drained soils of the uplands and second bottoms, or terraces, in the piedmont-plateau section are described as members of the Wadesboro, Granville, Cecil, Georgeville, Davidson, Alamance, Wickham, and Altavista series; and in the coastal-plain section as members of the Norfolk, Ruston, Marlboro, and Hoffman series.

73631—30——1

Under natural conditions the dominant soils are well drained, but under the present system of soil management a large proportion of them is excessively drained. Excessive drainage is less destructive to the soils in the coastal plain than to those in the piedmont plateau.

With the exception of well-drained soils on the first bottoms, the soils are naturally unproductive, and heavy applications of fertilizer are necessary in order to obtain satisfactory crop yields.

The agriculture is diversified, and no crop is dominant. Cotton is grown on a large acreage, because the climate and soils are favorable to its production and the crop is well suited to the prevailing system of agriculture. Good yields of cotton were obtained before the advent of the boll weevil, but in recent years this pest has caused yields to be greatly reduced.

The light-colored soils are well adapted to the production of bright tobacco which is used in the manufacture of cigarettes, and some grades of it sell at a high price. Vegetables, dewberries, and peaches are profitably grown on the light-colored sandy soils, because these soils warm up early in the spring and thereby hasten the maturity of crops.

Cattle raising and dairying are not followed in the southern, or coastal-plain section, because the soils are not well suited to the production of hay, small grains, and pasture. A few small dairies are located in the northern, or piedmont-plateau section, mainly because the soils in that section are adapted to the production of grains, grasses, and pasture.

COUNTY SURVEYED

Lee County is in the central part of North Carolina (fig. 1). Sanford, the largest town, is situated approximately in the center of the county and is about 60 miles southeast of Greensboro and 45 miles southwest of Raleigh, the State capital. The county is triangular in outline. Deep and Cape Fear Rivers form the northern boundary, separating Lee County from Chatham County. Lee County is one of the smaller counties of the State. It includes an area of 255 square miles, or 163,200 acres.

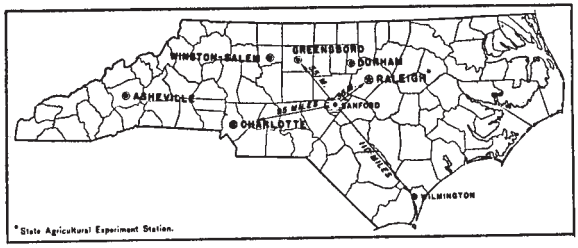


FIGURE 1.—Sketch map showing location of Lee County, N. C.

The county lies in both the coastal-plain and piedmont-plateau physiographic provinces. These provinces each include about one-half the total area, and they merge with a scarcely perceptible change in relief.

The area included in Lee County consists of a moderately high and generally level upland country, through which numerous streams have cut shallow to comparatively deep valleys ranging in width from one-half mile to 2 miles. The coastal-plain section, which comprises approximately the southern half, consists entirely of that division of

the coastal plain known as the sand hills. The general relief of this division conforms to that of the piedmont plateau rather than to the level and only slightly dissected plain farther east in the State. The valleys in the sand-hills section, in general, are not so deep as those of the piedmont-plateau section.

From dissection of the original upland, a country of varied relief has resulted, consisting of narrow or comparatively broad undulating or rolling interstream ridges, gentle and well-rounded slopes, and steep and broken areas near some of the streams. The broadest ridges of smooth relief lie in the eastern, central, and southern parts of the county in the vicinities of Broadway, Sanford, and Tramway. An area of similar relief extends from a point near Sanford northeastward to the vicinity of Olives. Narrower areas having undulating, gently rolling, and rolling relief are on the stream divides in the northwestern part. Areas of steep and broken relief have developed on slopes leading to Deep River in the northern part west of Olives, on slopes toward Cape Fear River in the extreme northeastern part, and on the slopes of some streams in the southern part. Along most of the streams are low almost level bottom lands ranging in width from a few feet to about three-fourths of a mile. In places, particularly near Deep River and Cape Fear River, are extensive terraces ranging from a few feet to about 2 miles in width. The relief of these terraces ranges from nearly level to rolling.

Elevations above sea level at several places along the Seaboard Air Line Railway are as follows:[1] Lemon Springs, 387 feet; Sanford, 368 feet; Colon, 335 feet; Osgood, 255 feet; and at a point three-fourths of a mile north of Olives, 218 feet. The highest elevation, 503 feet [2], is at Tramway; and the lowest, 165 feet, on Cape Fear River at the Harnett County line. The general slope is northward and eastward, the dividing ridge entering the southern part of the county at White Hill on the Moore County line and extending northeastward through Tramway and Jonesboro to Sanford and thence northward along United States Highways Nos. 1 and 501 to Deep River which forms a part of the northern boundary.

Deep, Cape Fear, and Upper Little Rivers provide outlets for practically all the drainage waters. Creeks, branches, and intermittent drainageways extend to all sections, and every farm is connected with at least one drainage outlet. Because of the moderately high elevation of the county above sea level, the rolling and sloping relief, and the completeness of the natural drainage system, surface drainage is good throughout the upland part, but on many of the steeper slopes run-off is so rapid that it causes serious erosion. In some of the low bottoms and in flats and depressions natural drainage is not well established, and ditches are necessary to provide adequate drainage.

The streams have cut their valleys from 50 to 150 feet below the general level of the upland, and the flow of water is sufficiently swift that their channels are still deepening. In some of the larger creeks and branches the flow is sufficient for development of water power, and gristmills are operated in some places. Deep River and Cape Fear River have sufficient fall for development of power on a com-

[1] GANNETT, H. A DICTIONARY OF ALTITUDES IN THE UNITED STATES. U. S. Geol. Survey Bull. 274, ed. 4, 1072 pp. 1906.

[2] CAMPBELL, M. R., and KIMBALL, K. W. THE DEEP RIVER COAL FIELD OF NORTH CAROLINA. N. C. Geol., and Econ. Survey Bull. 33, 95 pp., illus. 1923.

paratively large scale. Two hydroelectric plants are located on Deep River and one on Cape Fear River.

The original forest in the northern part of the county consisted of various oaks and a few pines and in the southern part was composed of longleaf pine, together with some turkey, blackjack, and post oaks, maple, hickory, and dogwood. Practically all the original forest growth has been removed, and the trees in this part are principally shortleaf pine and white, black, red, and post oaks, with some cedar, hickory, dogwood, maple, and poplar. Although the forests are rather open, an undergrowth of small oaks, pine, and cedar is present in some places. In the southern part the tree growth consists of shortleaf pine, turkey and blackjack oaks, and a few scattered longleaf pines, hickory, and dogwood. In many places an undergrowth of wire grass covers the ground. Along the streams the tree growth is dense in many places and consists of sycamore, birch, elm, and ash, and there is an undergrowth of various shrubs and vines.

Lee County is one of the most recently organized counties in the State. It was formed in 1908 from parts of Moore and Chatham Counties. The first settlers in the country now included in this county were people of Scotch descent who moved up the Cape Fear River Valley from Wilmington, prior to the Revolutionary War, and established homes. The present inhabitants are mainly descendants of the early settlers, and a few have moved in from nearby counties. The proportion of colored people is large. According to the 1930 census the inhabitants numbered 16,996 in that year. Of this number, about 75 percent is classed as rural. The population is fairly evenly distributed, and the density is 65 persons a square mile. Sanford has a population of 4,253, and, although it is considered by some to be the county seat, the courthouse itself is located midway between Sanford and Jonesboro, being 1 mile from each place. Smaller towns are Jonesboro, Broadway, Lemon Springs, Cumnock, and Colon, which are mainly local trading places and markets for the farm produce of their vicinities.

Railroad transportation is excellent. Four railway lines serve the county, and practically all sections are within easy reach of a railway station. Hard-surfaced Federal and State highways traverse the county, and in addition, the State maintains numerous well-constructed gravel roads which extend to all sections and can be traveled throughout the year.

Consolidated rural schools, to and from which the school children are conveyed by bus, are located in the towns and villages. Churches are situated at convenient places throughout the rural sections and in the towns. Telephone lines and rural mail routes serve all sections. The supply of well water is sufficient, but in some places the quality is not very good.

Nearby markets for the agricultural products grown are Greensboro, Raleigh, and Fayetteville. Washington, Baltimore, Philadelphia, and New York are the more distant markets for peaches and dewberries.

Several manufactories are in operation in this county, most of which are in Sanford and Jonesboro. An abandoned coal mine and a few old sandstone quarries are located at Cumnock.

CLIMATE

Although considerable variation occurs in the seasonal temperatures and a wide difference between the highest summer and the lowest winter temperatures, the climate is mild and favorable to the growing of many different crops. The winters are short and not extremely cold. The ground is sometimes frozen to a slight depth for a short period. The snowfall is light and remains on the ground only a short time. Outdoor work can be performed most of the winter, and the temperature is sufficiently mild for the growing of cover crops and hardy vegetables. Ordinarily the summers are long and warm but not oppressive.

The average length of the frost-free season is 192 days, which is sufficient for maturing the crops commonly grown. The average dates of the latest and earliest killing frosts are April 15 and October 24, respectively, but frost has been recorded as late as May 1 and as early as October 9. The rainfall is ample and is well distributed for the successful growing of crops. Precipitation is heaviest in the spring and summer and lightest during the fall. Complete crop failures from drought are rare.

As no Weather Bureau station is located in Lee County, table 1, showing the normal monthly, seasonal, and annual temperature and precipitation, was compiled from the records of the station at Moncure, Chatham County, which is only a few miles from the northern boundary of Lee County. The data for this station may be considered representative of climatic conditions in Lee County.

TABLE 1.—*Normal monthly, seasonal, and annual temperature and precipitation at Moncure, Chatham County, N. C.*

[Elevation, 232 feet]

Month	Temperature			Precipitation			
	Mean	Absolute maximum	Absolute minimum	Mean	Total amount for the driest year (1933)	Total amount for the wettest year (1929)	Snow, average depth
	°F.	°F.	°F.	*Inches*	*Inches*	*Inches*	*Inches*
December	42.3	77	1	3.29	1.14	2.69	1.2
January	41.8	84	−9	3.26	3.13	2.54	1.2
February	42.6	80	−3	3.97	3.50	7.76	2.7
Winter	42.2	84	−9	10.52	7.77	12.99	5.1
March	51.8	94	13	3.84	1.23	6.72	.4
April	58.9	94	23	3.48	3.39	2.64	.3
May	66.3	100	29	3.70	3.19	6.75	.0
Spring	59.0	100	13	11.02	7.81	16.11	.7
June	75.2	104	44	4.27	1.18	6.93	.0
July	78.3	106	47	5.10	4.37	4.27	.0
August	77.2	102	46	4.88	3.88	4.26	.0
Summer	76.9	106	44	14.25	9.43	15.46	.0
September	71.9	98	36	3.65	.37	2.10	.0
October	60.7	95	24	2.72	.70	13.50	.0
November	50.0	82	9	2.23	1.64	5.04	.2
Fall	60.9	98	9	8.60	2.71	20.64	.2
Year	59.8	106	−9	44.39	27.72	65.20	6.0

AGRICULTURAL HISTORY AND STATISTICS

Agriculture had its beginning in the territory now occupied by Lee County many years before the Revolutionary War. At first it was confined to the fertile bottoms along streams and to the stronger soils of the uplands. In the early days agriculture was self-sufficing and consisted in the production of corn, wheat, oats, fruits, sweetpotatoes, other vegetables, and a home supply of cotton and tobacco; and the raising of cattle, sheep, and hogs. Sheep were raised for a home supply of wool and mutton. Some cattle were driven to Fayetteville for marketing. Cotton and wool were spun and woven in the homes for a supply of cloth, and hides were tanned for leather. Grain was ground into flour or meal for home consumption at local gristmills.

In the early agriculture, barnyard manure was the chief soil amendment. A few years before the Civil War, Peruvian guano was first applied to wheatland and cornland in this section. Ready-mixed fertilizers were introduced about 1870, and improved farm implements were adopted about 1895.

In the days before Sanford was connected with Fayetteville by railroad, a steamboat line operated on Cape Fear River from Fayetteville to Lockport, a place not far distant from Sanford, and thus an outlet was furnished for the farm products to be transported to Fayetteville, an important market.

The southern part of the county originally supported a heavy stand of longleaf pine and the northern part a considerable stand of oak. Lumbering was important for many years after the Civil War. As the uplands were gradually cleared of timber, new lands were brought under cultivation, and farming spread to all parts of the county.

The production of cotton as a cash crop was started in this section of the State on a small scale about 1850, and the growing of tobacco as a cash crop was begun in a limited way about 1885. Dewberries were first grown for market about 1900. The Federal census report of 1910, the first after Lee County was formed, shows the leading crops of the county to have been corn, cotton, oats, and wheat.

Table 2 gives the acreage of the various crops grown in 1909, 1919, 1929, and 1934.

TABLE 2.—*Acreage of the principal crops in Lee County, N. C., in stated years*

Crop	1909	1919	1929	1934	Crop	1909	1919	1929	1934
	Acres	*Acres*	*Acres*	*Acres*		*Acres*	*Acres*	*Acres*	*Acres*
Cotton	7,839	10,761	12,214	------	Tobacco	25	1,211	3,154	3,682
Corn	12,582	12,227	9,945	12,668	Dewberries	2	57	39	------
Wheat	1,446	3,047	1,977	2,713					
Oats	2,184	654	332	1,547		*Trees*	*Trees*	*Trees*	*Trees*
Dry peas	520	489	361	------	Apples	11,899	17,593	8,030	------
Dry edible beans	5	27	268	------	Peaches	16,036	8,119	15,972	------
Sweetpotatoes	396	498	363	457					
Potatoes	20	44	183	146		*Vines*	*Vines*	*Vines*	*Vines*
Hay and forage	945	8,180	1,406	4,226	Grapes	3,425	2,231	1,999	------

Table 3 gives the value of all agricultural products by classes in 1929.

TABLE 3.—*Value of agricultural products by classes in Lee County, N. C., in 1929*

Crop	Value	Livestock and products	Value
Cereals	$204,098	Domestic animals	$393,247
Other grains and seeds	3,081	Dairy products sold and butter churned	99,282
Hay and forage	21,460	Poultry and eggs	127,963
Vegetables (including potatoes and sweetpotatoes)	60,052	Wool	44
Fruits and nuts	39,983	Total	620,536
All other field crops	822,804	Total agricultural products	1,868,132
Farm garden vegetables (excluding potatoes and sweetpotatoes) for home use only	96,118		
Total	1,247,596		

According to the 1930 census, the use of fertilizer in 1929, either in the form of commercial or home mixtures, was reported on 1,519 farms. The total expenditure for fertilizer was $237,158, or an average of $156.12 a farm reporting its use. The fertilizer consists of 2–8–2,[3] 3–8–3, 3–9–3, 4–8–4, and 4–10–4 ready-mixed fertilizer or home mixtures analyzing about the same as the commercial mixtures. In addition to these fertilizers, many farmers apply nitrate of soda or sulphate of ammonia as a top or side dressing. All available barnyard manure is applied to the land. On some farms soil fertility is increased by growing and turning under leguminous crops.

Farm labor is plentiful and reasonable in price. Both white and colored laborers are employed. The number of farms on which hired labor is used is comparatively large. In 1929, 41 percent of the farms reported a total expenditure of $44,899 for labor, or an average of $66.91 a farm reporting.

The number of farms purchasing feed is comparatively large, and in 1929, 59 percent of the farms expended for this purpose a total of $60,932, or an average of $63.40 a farm reporting.

The 1935 census reports the average size of farms to be 69.4 acres. The greater number of farms range in size from 20 to 200 acres—a few are larger and a few smaller. According to the census, the average value of farm land, including buildings, in 1930 was $38 an acre and in 1935 had decreased to $28.24. In 1935, 54.1 percent of the farms were operated by owners and part owners, 45.7 percent by tenants, and 0.2 percent by managers. Practically all the tenant farms are rented on the crop-share basis, by which the landlord receives one-third or one-half of the crops as rent.

The farm homes on the owner-operated farms are substantial, and most of them are painted and kept in good repair, but many of the tenant houses are small. The barns are well built and are sufficiently large for the care of livestock, and outbuildings for storage purposes are on nearly every farm. Farm implements are adequate for the needs of most of the farms. The work animals are chiefly mules, and these are generally well housed and fed. Fences are constructed mostly of barbed wire. Most of the cattle are grades, but several purebred bulls and milk cows are kept.

According to the 1935 census the kinds and number of livestock on the farms are as follows: Horses and colts,[4] 244; mules and mule colts,[4] 1,677; cattle,[4] 3,663; sheep and lambs, 32; and hogs and pigs,

[3] Percentages, respectively, of nitrogen, phosphoric acid, and potash.
[4] Excludes animals under 3 months of age Apr. 1, 1930.

3,263. The increase in the number of cattle over the number in 1930 was large. The number of hogs showed an increase of 18 percent during the same period. Although the amount of crop land harvested remained about the same, the number of horses and mules has decreased 12.5 percent since 1930.

SOILS AND CROPS

The soils of Lee County are varied in color, texture, and structure in both the surface soil and subsoil. The soils range in extent from small and scattered areas of only a few acres each to large and continuous areas of several square miles. The surface soils range from light-gray and grayish-yellow friable sandy loam to brownish-red and red silty clay loam and clay loam, and the subsoils from yellow friable sandy clay to red brittle clay and mottled plastic clay. The county is underlain by several distinct rock or geological formations which differ in texture and in mineral composition. Most of the soils are derived directly from the decomposed material of these formations, and the diversity of soils is due in large measure to differences in the underlying soil-forming material.

Although the soils present a diverse appearance, a definite and uniform arrangement of the several layers is common to most of them. A deep cut by the roadside or an excavation through the soil reveals that, from the surface downward, the soil is composed of three distinct layers, or horizons. The first is the surface soil which may differ in color and texture from place to place; the second is the subsoil which is heavier in texture and structure than the surface layer; and the third, composed of soft decomposed rock or sandy clay material which is lighter and more friable than the subsoil, is in the transitional zone between the underlying bedrock and the subsoil. This threefold arrangement is common to all the soils of the uplands, except the deep sand (Norfolk sand), in which no distinct profile has developed, and Hoffman sandy loam, in which the sandy surface layer in most places directly overlies the partly weathered soil material.

The soils of this county have been classified according to soil series, soil types, and soil phases. The soil series includes soils which are similar in subsoil characteristics, parent material, condition of drainage, and character of relief. The soil type is a member of the soil series, and the several types of a series differ from each other in the texture of the surface soil, or the proportions of different-sized soil particles, as sand, silt, and clay. Thus a soil series may be represented by several types, as sandy loam, clay loam, and silt loam, all based on differences in soil texture. The soil phase indicates a significant variation within the soil type, such as the presence of a large number of stones or gravel on the surface or steeper relief than normal. A fine sandy loam soil may have a large number of rock fragments scattered on the surface and is designated as fine sandy loam, stony phase. If the relief of the fine sandy loam is steeper than typical, the soil is separated as fine sandy loam, steep phase. The soil series is given the geographic name of the place where

the soil was first classified and mapped, for instance, the Norfolk series, which signifies the soil was first identified near Norfolk. To the series name is added the type classification, thereby identifying the type with the series, as Norfolk sandy loam or Cecil clay loam. Where the soil differs somewhat from typical, a phase designation is given, as Norfolk sandy loam, gravelly phase.

The southern part of the county lies within the sand-hills division of the Atlantic Coastal Plain and includes an area of about 100 square miles. The underlying geological formation consists of unconsolidated sand, sandy clay, and clay. Through soil-forming processes, material of this formation has been converted into large areas of soil characterized by the presence of an unusual amount of sand. In some places the soil is composed almost entirely of sand to a depth of several feet, and in other places a sandy clay subsoil has developed. The soils derived from this formation include types of the Norfolk, Ruston, Marlboro, and Hoffman series. The Norfolk soils have yellow friable sandy clay subsoils; the Ruston soils are characterized by reddish-yellow or yellowish-red friable sandy clay subsoils; the Marlboro soils have deep-yellow friable and somewhat sticky sandy clay subsoils; and the surface soil of the Hoffman soil in most places is underlain by the mottled yellow, red, and gray sticky sandy clay of the parent material.

The northern part of the county is in the piedmont plateau, and the soils in this part are noticeably different from those of the southern part. The surface soils in some places, instead of being light and sandy, are fine textured and heavy, and in other places they consist of reddish-brown or red heavy clay loam. The subsoils almost everywhere are red stiff but brittle clays or silty clays. A large part of this section is underlain by fine-textured brown sandstone and Indian-red or purplish-red shale and mudstone. These rocks underlie an area of about 130 square miles, and the soils developed over them are prevailingly fine textured and comparatively heavy. The soils are types of the Wadesboro, Granville, and White Store series. The subsoils of the Wadesboro soils are light-red or brick-red stiff friable clays; those of the Granville soils are yellow friable clays; and those of the White Store soils are mottled heavy plastic clays.

In the northern part of the county near Deep River is a comparatively narrow belt of slate rock known as the Carolina slates. This formation has a total extent of about 10 square miles. It is about 1½ miles wide and 7 miles long. The slate is hard and brittle and very fine grained. Soils developed from the weathered products of these rocks are highly silty in texture, and the surface soils have a smooth floury feel. The soils derived from this formation are members of the Georgeville and Alamance series. The subsoils of the Georgeville soils are red brittle friable silty clays, and those of the Alamance soils are yellow friable silty clays.

An area of crystalline schists and granitic rocks underlies the eastern part of the county, having a total extent of about 20 square miles. The soils overlying this formation are types of the Cecil series. The subsoils are red stiff but brittle clays which, in most places, contain finely divided flakes of mica. Soils of this series,

except the Durham and Appling soils, contain a higher percentage of potash than do other soils of the piedmont plateau.

Within these rock formations are small areas of dark-colored heavy rock. The soil developed from the decomposed material of this rock belongs to the Davidson series. The subsoils are deep-red or maroon heavy friable smooth clays, free from sand. These soils are the reddest soils in the county.

On the boundary between the coastal plain and the piedmont plateau, soils have developed from material of both provinces, and these have been classed as types of the Bradley and Chesterfield series. The Bradley soils have red firm but brittle clay subsoils, and the Chesterfield soils have yellow friable clay subsoils.

Comparatively extensive areas of soil have developed on the terraces along Deep, Cape Fear, and Upper Little Rivers, and Lick Creek. These soils have been formed from materials brought down by streams and deposited during times of overflow. They include types of the Wickham, Altavista, and Roanoke series. The subsoils of the Wickham soils are red or brownish-red rather stiff friable clays, those of the Altavista soils are yellow friable clays, and those of the Roanoke soils are mottled yellow and gray heavy plastic clays.

Soils of the Congaree series are developed from deposits of alluvium on the first bottoms along the streams. These are brown friable soils containing a large amount of silt. Meadow includes mixed poorly drained alluvial soil material on some of the first bottoms.

All the soils of the uplands are deficient in organic matter, as they have developed under forest cover where conditions were not favorable to the accumulation of a large amount of decaying vegetation. In forested areas a small quantity of vegetable matter is present in the topmost inch or two of the surface soil, but this has not become incorporated in the soil and, when the land is cleared for farming, the small supply of organic matter is soon lost through cultivation of the soil.

All the soils are more or less acid, as, owing to the rather heavy annual rainfall, any lime in the form of carbonate that may have formed in them has been dissolved and carried downward by the percolating ground water. Another common characteristic of the soils is their leached condition. This is particularly evident in the sandy soils in the southern part of the county, although the surface soils of most of the soils in the northern part also have been affected by leaching. The heavy annual rainfall, mild temperatures, and the open friable consistence of the soils promote leaching; and, as the soils are frozen for only short periods during the winter, leaching continues throughout most of the year. As a result of leaching, much of the soluble plant nutrients in the surface soil has been transferred to the subsoil or to even lower depths out of reach of plant roots.

Sheet erosion and gullying have been active ever since the soils were first cleared of their virgin forests. Many areas that once had good tillable soils became so extremely eroded and gullied through improper management that they had to be taken out of cultivation, and at present a large acreage of such land is covered with old-field pine. When these fields became unfit for crops, new fields were brought under cultivation. Frequently land has been abandoned

and subsequently suffered severe erosion before a new forest cover developed. In unprotected fields, particularly in the northern part of the county, erosion is still causing serious damage to many soils.

Owing to loss of fertility in the surface soil through leaching, acidity, lack of permanent supply of organic matter, and losses through erosion, the farmer is constantly confronted with the problem of managing his land so as to achieve not only soil conservation but also soil improvement.

Although Lee County has a total area of 163,200 acres, only about 25 percent of this acreage is used for field crops and plowable pasture. According to the 1935 census, 40,015 acres were available for crops, and crops were harvested from 30,636 acres in 1934. The amount of land in pasture was 12,396 acres, of which 2,244 acres were plowable pasture, 8,156 acres woodland pasture, and 1,996 acres other pasture. Nearly all the rest of the land is in forest or is being reforested.

No crop dominates the agriculture, and no important crop is grown exclusively in any one locality. Cotton, tobacco, and corn—the principal crops—are well distributed over the greater part of the county. This general distribution of the crops is due to the fact that soils suitable for their production are developed to greater or less extent throughout the county. In a general way, and in some places specifically, a close relationship is evident between the soil type and the crops grown. Particularly is this applicable to tobacco, peaches, and dewberries.

Norfolk sandy loam; Norfolk sandy loam, deep phase; Marlboro sandy loam; Ruston sandy loam, deep phase; Ruston gravelly sandy loam; Granville very fine sandy loam; Wadesboro silt loam; and Wadesboro gravelly silt loam produce the greater part of the tobacco and cotton, and they practically dominate the agriculture. The Wickham and Congaree soils are highly productive soils, especially for corn, which occur mainly in narrow bottom and terrace areas along the rivers. Even though of small extent, these soils have some influence on the agriculture in sections where they occur. By using the productive soils for cultivated crops, adjacent land, less adapted to intertilled crops, may be devoted to pasture, and a satisfactory farm unit will be developed, in which soil erosion is conveniently controlled.

The main cash crops are cotton and tobacco, and peaches, dewberries, and sweetpotatoes are of minor importance. Dairying is carried on only to supply the needs of the towns and is localized in the northern part of the county. The agriculture in a part of the county is self-sufficing, that is, the farmers produce feed for the livestock and food for the family. This type of agriculture is followed particularly on the better farms in the northern part of the county, because the heavy-textured soils in this part are better suited to the production of small grains, clovers, and vetch, and also for pasture purposes than are the more sandy soils in the coastal plain, or southern part.

Cotton occupies a large acreage. It is grown to greater or less extent on every well-drained soil, but the farmers recognize that the sandy loams or light-textured soils having sandy clay or clay subsoils are best suited to its production. Since the advent of the boll weevil, the sandy soils have been more extensively used than

the heavy soils for the production of cotton, because the sandy soils warm up earlier in the spring and mature most of the bolls before the boll weevil becomes destructive. Also the sandy soils are easy to till with hand tools and light machinery, and they drain quickly and can be cultivated soon after rains. Although these sandy soils are low in plant nutrients, because of their favorable structure, they respond readily to fertilization, and thus by quick stimulation the cotton plants mature their bolls before the occurrence of frost. Prior to the advent of the boll weevil, some of the heavier textured soils were considered best for the production of cotton, but the boll weevil has cut the yield of cotton on these heavy soils about 25 percent.

The main reason for the large acreage in cotton is that the farmers need cash, and cotton meets this requirement better than any crop known to them. They have grown cotton for a long time and understand handling the crop to the best advantage.

Tobacco is an important cash crop, and perhaps the gross income from its sale equals or exceeds that of cotton, but the cost of producing tobacco and the work required in cultivating and handling it are far greater than for cotton. Usually a higher grade and a larger quantity of fertilizer is applied to tobacco than to any other crop commonly grown here. A direct relationship exists between the quality of the tobacco and the soil type on which it is produced. The sandy surface soils underlain by yellow sandy clay or clay subsoils, such as Norfolk sandy loam, Norfolk sandy loam, deep phase, Marlboro sandy loam, and Granville very fine sandy loam, produce the best quality of bright-leaf tobacco. The yields obtained from these soils are not quite so large as those from the heavier soils, but the superior quality of the tobacco and the higher price obtained for it more than offset the larger yields. All the tobacco is artificially cured, that is, flue cured.

Corn is grown on every arable soil in the county and occupies a large acreage. Yields are generally low, owing to the low content of organic matter and mineral plant nutrients and because only light applications of fertilizers are commonly used. Congaree silt loam, developed in the first bottoms, is naturally the most fertile soil and in most places possesses favorable moisture conditions. This soil produces large yields of corn without the addition of fertilizer. Practically all the corn grown is used for feeding work animals and cattle and for fattening hogs, or is ground into meal for domestic use. The total quantity produced is not sufficient to meet the local requirements.

The acreage devoted to hay and sorgo (sweet sorghum) for forage increased between 1929 and 1934 because of the large increase in the number of cattle during this period.

The acreage devoted to the production of wheat is comparatively small. Practically all the wheat is grown in the piedmont-plateau section, mainly on the Wadesboro, Georgeville, and Cecil soils, and some is grown on the Wickham and Altavista soils. These heavy-textured soils have the most favorable physical properties for growing this crop; and, in addition, the subsoils have a larger content of potash and other plant nutrients than the subsoils of the sandy soils. Not enough wheat is grown to supply the local need for flour. Most of the wheat is ground locally and used for home consumption, although a small quantity is sold by some farmers.

Only one large commercial peach orchard is in the county, but many farms have small home orchards of peach trees. A small acreage is devoted to the production of dewberries. The fruit crops are produced mainly in the sand-hill section. The soil and climate in the southern part of the county are as favorable for the production of peaches, dewberries, sweetpotatoes, and other truck crops as are similar soils around Aberdeen, Hoffman, and other places in the sand hills of North Carolina.

Every well-established farm has a few fruit trees, a garden plot, a few hogs, from one to three cows, and a flock of chickens. Small quantities of sweetpotatoes, sorgo, and potatoes are produced, largely for home use. Hairy vetch, oats, clover, cowpeas, and a little alfalfa are grown, mainly for hay.

The soils of this county may be divided, according to soil characteristics, agricultural use, and crop adaptation, into four groups: (1) Light-colored soils with yellow subsoils, (2) light-colored soils with red subsoils, (3) red soils with red heavy subsoils, and (4) miscellaneous land types.

In the following pages the soils are described in detail, and their agricultural relationships are discussed; their distribution is shown on the accompanying soil map; and their acreage and proportionate extent are given in table 4.

TABLE 4.—*Acreage and proportionate extent of the soils mapped in Lee County, N. C.*

Soil type	Acres	Per-cent	Soil type	Acres	Per-cent
Norfolk sandy loam	7,424	4.6	Ruston gravelly sandy loam	2,944	1.8
Norfolk sandy loam, deep phase	12,608	7.7	Ruston sandy loam, deep phase	1,536	.9
Norfolk sandy loam, gravelly phase	448	.3	Cecil clay loam	2,432	1.5
Norfolk sand	5,632	3.5	Davidson clay loam	576	.4
Marlboro sandy loam	1,216	.7	Georgeville gravelly silty clay loam	2,496	1.5
Chesterfield sandy loam	704	.4	Wickham sandy loam	1,088	.6
Chesterfield sandy loam, gravelly phase	384	.2	Wickham sandy loam, high-terrace phase	704	.4
Granville very fine sandy loam	10,688	6.6	Wickham very fine sandy loam	384	.2
Granville very fine sandy loam, gravelly phase	6,848	4.2	Congaree silt loam	6,464	4.0
Alamance gravelly silt loam	1,600	1.0	Norfolk sand, hilly phase	1,472	.9
Altavista very fine sandy loam	1,856	1.1	Hoffman sandy loam	10,432	6.4
Altavista very fine sandy loam, high-terrace phase	256	.2	Cecil fine sandy loam, stony phase	576	.4
Wadesboro silt loam	13,760	8.4	Cecil clay loam, stony phase	4,224	2.6
Wadesboro gravelly silt loam	9,408	5.8	White Store silt loam	6,464	4.0
Wadesboro gravelly silt loam, mixed phase	15,872	9.7	Wadesboro gravelly silt loam, eroded phase	9,088	5.6
Cecil fine sandy loam	2,112	1.3	Roanoke silt loam	1,472	.9
Cecil fine sandy loam, gravelly phase	2,688	1.6	Meadow	2,688	1.6
Georgeville gravelly silt loam	2,432	1.5	Guin soils, undifferentiated	128	.1
Bradley sandy loam	5,568	3.4	Rock outcrop	256	.2
Bradley sandy loam, gravelly phase	6,272	3.8	Total	163,200	

LIGHT-COLORED SOILS WITH YELLOW SUBSOILS

The soils in the group of light-colored soils with yellow subsoils comprise an area of 77.6 square miles, or 30.5 percent of the total area of the county.

The surface soils of these soils are light gray or grayish yellow, and the subsoils are yellow or pale yellow and are friable. The Norfolk, Marlboro, and Chesterfield soils, which are developed in the coastal-plain section, are sandy and porous, and both surface and

internal drainage are good. They warm up early in the spring and can be cultivated soon after rains. They are among the first soils on which farming operations can be carried on in the spring, and they have a longer growing season than most of the soils. The Granville, Alamance, and Altavista soils are developed in the piedmont-plateau section. These soils are fine textured and on this account are somewhat harder to till than the light sandy soils. Owing to their fine texture, internal drainage is not so well established as in the sandier soils.

The relief of the soils of this group ranges from almost level to strongly rolling near some of the drainageways.

Every soil in the group is especially suited to the production of bright tobacco. These soils, as a whole, are probably the lowest in organic matter. They are also low in nitrogen and the mineral plant nutrients, as they have been subjected to considerable leaching, but most of them respond readily to fertilization and produce some of the most profitable crops grown.

Norfolk sandy loam.—The 4- to 6-inch surface layer of Norfolk sandy loam is gray, light-gray, or grayish-brown light sandy loam or loamy sand, which passes into pale-yellow loamy sand or sandy loam extending to a depth ranging from 10 to 20 inches. The subsoil is yellow friable crumbly sandy clay to a depth ranging from 30 to 38 inches and is underlain by mottled reddish-brown, light-gray, and yellow friable sandy clay. In some forested areas the surface soil to a depth of 3 or 4 inches is dark gray, owing to an accumulation of decomposed vegetable matter; and in places the thickness of the surface soil has been reduced by erosion, and the subsoil is near the surface.

Norfolk sandy loam is developed in the southeastern half of the county, the largest areas occurring around Tramway and south of Jonesboro. Smaller bodies are scattered throughout the southeastern part. Most of this soil occupies smooth interstream ridges, and both surface and internal drainage are good.

This is one of the best agricultural soils in the southeastern half of the county, but its total extent is comparatively small. Approximately 75 percent of the land is under cultivation, mainly to cotton and tobacco. About 50 percent of the cultivated land is planted to cotton and about 30 percent to tobacco.

Cotton receives an acre application ranging from 200 to 600 pounds of 2–8–2 or 4–10–4 fertilizer, and acre yields range from one-fourth to three-fourths of a bale. Tobacco is fertilized with from 600 to 1,200 pounds an acre of a 3–8–3 or 4–10–6 mixture and yields from 600 to 900 pounds of leaf. Corn is given an acre application ranging from 200 to 600 pounds of 2–8–2 or 4–10–4 fertilizer and yields from 15 to 35 bushels. Without fertilizer corn yields about 10 bushels an acre and cotton one-eighth of a bale. Vegetables and other crops do well on this soil when large quantities of fertilizer are applied.

Norfolk sandy loam, deep phase.—Norfolk sandy loam, deep phase, resembles typical Norfolk sandy loam in most characteristics and differs from it mainly in the thickness of the surface soil, which in most places is 20 inches thick and in many places is 30 or more inches thick over the yellow friable sandy clay subsoil. This soil

is developed in close association with areas of typical Norfolk sandy loam and Norfolk sand, and small spots of these two soils are included in mapping.

Soil of this phase has a larger total acreage than typical Norfolk sandy loam, but only about 40 percent of the land is used for the production of crops. About 50 percent of the cultivated land is planted to tobacco, 20 percent to cotton, and the rest to other crops. The kinds and quantities of fertilizer used for crops on this soil are about the same as for similar crops on typical Norfolk sandy loam, but yields of all crops are slightly lower. Peaches and dewberries do well, and this is an excellent soil for the production of truck crops of many varieties.

Norfolk sandy loam, gravelly phase.—Norfolk sandy loam, gravelly phase, is the same in color, texture, and structure as typical Norfolk sandy loam, except that numerous rounded quartz gravel, ranging in diameter from one-sixteenth to 1 inch, and composing from 10 to 50 percent of the soil mass, are scattered on the surface and mixed with the surface soil.

Soil of this phase is developed in small areas in the vicinities of Tramway and Broadway, and approximately 80 percent of the land is under cultivation. The relief ranges from almost level to undulating, and drainage is everywhere good. Corn, cotton, and tobacco are the principal crops. The fertilizers used and the yields obtained are practically the same as for similar crops on typical Norfolk sandy loam.

Norfolk sand.—Norfolk sand consists of a layer of gray or grayish-yellow loose medium sand ranging from 5 to 8 inches in thickness, underlain by yellow or pale-yellow incoherent sand which extends to a depth of 40 or more inches. In some cleared areas the topmost inch or two of the surface layer is light gray or almost white. In forested areas, where considerable decomposed vegetable matter has accumulated on the surface, the soil is gray or dark gray to a depth of 1 or 2 inches. In some of the more rolling areas, the soil, at a depth ranging from 15 to 20 inches below the surface, is yellowish-red or reddish-yellow loose sand. In some level areas, the soil, to a depth of 5 or 6 inches, is slightly heavier than typical. Included with this soil as mapped are spots of Norfolk sand, hilly phase, and small areas of Norfolk sandy loam, deep phase. In some places a few rounded quartz gravel are present on the surface.

This soil occurs only in the coastal-plain section in the southeastern half of the county. The largest areas are in the vicinity of Lemon Springs, east of Jonesboro, and in the southern part near the Harnett County line. This soil is developed on broad smooth interstream ridges and on gentle to rolling slopes. Both surface drainage and internal drainage are well established.

Approximately 25 percent of the land is cleared of forest growth and under cultivation. The rest supports a growth of scrub oak, blackjack oak, and a few dogwood and pine trees. Tobacco is the principal crop, and cotton and corn are grown to a smaller extent. Much larger applications of fertilizer are required to produce these crops on this soil than on Norfolk sandy loam, and yields are somewhat lower than on that soil. This soil is adapted to the production of dewberries, and some of it is used for this purpose. It is also

well suited to peaches, and the only commercial peach orchard in the county is located on it. The soil also is adapted to oats, rye, cowpeas, vetch, sweetpotatoes, vegetables, watermelons, cantaloups, and grapes.

Most of the land lies favorably for cultivation, and, because of its open friable consistence, it is easy to till. It readily absorbs rain water and can be cultivated soon after rains.

Marlboro sandy loam.—The 5- to 8-inch surface layer of Marlboro sandy loam is gray or grayish-brown light sandy loam. It is underlain by deep-yellow sandy loam extending to a depth ranging from 8 to 12 inches. The subsoil is deep-yellow or light brownish-yellow slightly sticky but friable sandy clay which extends to a depth ranging from 40 to 45 inches, where it passes into the parent material of mottled and streaked slightly cemented sand and clay. This soil is somewhat similar to Norfolk sandy loam and differs from that soil mainly in having a shallower surface soil and a slightly heavier subsoil. Most areas of this soil have thicker surface layers than are common for similar soil in other counties. Where this soil adjoins Ruston gravelly sandy loam, it is gravelly on the surface, and the subsoil has a reddish-yellow cast. Included with this soil as mapped are a few spots of Ruston gravelly sandy loam.

Marlboro sandy loam occurs on almost level or flat interstream divides in the coastal-plain section. The largest areas are in the vicinity of Broadway and 1½ miles south of Jonesboro.

This is a somewhat more productive soil than Norfolk sandy loam, but it is less well drained, owing to its almost level relief. It is not very extensive but is probably the most desirable soil in the county. Practically all of it is under cultivation, and it is well suited to the production of the staple crops—cotton and tobacco.

Fertilizer treatment, soil management, and crops grown are about the same as on Norfolk sandy loam, and yields are slightly higher. Marlboro sandy loam responds readily to fertilization and to organic matter in the form of barnyard manure or green manure, and the land is easily maintained in a high state of productivity.

Chesterfield sandy loam.—The surface soil of Chesterfield sandy loam is grayish-yellow or brownish-gray light sandy loam ranging from 6 to 10 inches in thickness. A few rounded quartz gravel are scattered on the surface and intermixed with the surface soil. The subsoil, to a depth ranging from 10 to 15 inches, is yellow friable sandy clay similar to the Norfolk subsoil, and below this, to a depth of about 35 inches, is yellow friable crumbly clay derived from decomposed rock material.

The soil is developed on the border line between the coastal plain and the piedmont plateau, and the thickness of the coastal-plain material overlying the piedmont-plateau material ranges from a few inches to about 30 inches. Small areas of Norfolk sandy loam and Bradley sandy loam are included with this soil in mapping.

Chesterfield sandy loam occurs only in the south-central part of the county. The largest areas are southeast of Tramway and 2 miles southwest of Broadway.

The relief ranges from rolling to strongly rolling, and drainage is good. This is not an important agricultural soil because of its small extent and strongly rolling relief. Soil management, fertilizer ap-

plications, and crops grown are about the same as on Bradley sandy loam. Crop yields, however, are slightly less than on the Bradley soil.

Chesterfield sandy loam, gravelly phase.—Chesterfield sandy loam, gravelly phase, is different from Chesterfield sandy loam mainly in that many rounded quartz gravel, which comprise from 15 to 60 percent of the surface soil, are scattered on the surface and intermixed with the surface soil. The relief ranges from rolling to strongly rolling, and drainage is well established.

Areas of this soil are south of Grace Chapel and west and southwest of Broadway. Soil of this phase is agriculturally unimportant, owing to its small extent and unfavorable relief.

Granville very fine sandy loam.—The surface soil of Granville very fine sandy loam is gray, grayish-yellow, or pale-yellow very fine sandy loam to a depth ranging from 6 to 13 inches. Although the surface soil is very fine sandy loam in texture, it contains a noticeable amount of silt. The subsoil is yellow friable very fine sandy loam which ranges in depth from 28 to 36 inches. Below the subsoil is a layer of mottled brownish-yellow, gray, and red friable soil material, although in some places the subsoil passes into Indian-red sandstone or shale at a depth of about 18 inches. A few sandstone fragments are on the surface in places, and on some of the sharp rises and slopes the sandstone comes near the surface or outcrops. Included with this soil as mapped are a few areas of Granville very fine sandy loam, gravelly phase, Wadesboro silt loam, and Wadesboro gravelly silt loam. These areas were too small to indicate on the soil map.

Granville very fine sandy loam occurs mainly in the northwestern part of the county. The largest areas are in the vicinity of New Hope Church, east and west of Pocket Creek, south of Cumnock, and along United States Highway No. 501 north of Sanford; and numerous smaller areas are distributed throughout the northern part.

Granville very fine sandy loam is developed on interstream flats and slopes to drainageways. The relief ranges from almost level to rolling, but in a few places near the streams it is strongly rolling. In general, this soil has a smoother surface than Wadesboro silt loam. Both the surface and internal drainage in most places are well established, but in flat areas near the sources of streams drainage is inadequate.

About 20 percent of the land is under cultivation, and approximately 25 percent of the cultivated area is planted to corn, 25 percent to cotton, 25 percent to tobacco, 10 percent to wheat, 10 percent to oats, and 5 percent to other crops. A very small proportion is used for permanent pasture. Corn yields from 10 to 25 bushels, cotton from one-fourth to one-half bale, and tobacco from 600 to 900 pounds an acre. This soil is managed and fertilized for each crop in about the same manner as is Wadesboro silt loam.

Granville very fine sandy loam, gravelly phase.—The gravelly phase of Granville very fine sandy loam differs from typical Granville very fine sandy loam in that it has from 15 to 50 percent of quartz gravel, ranging in diameter from one-fourth inch to 2 inches, on the surface and intermixed with the surface soil. This gravelly soil occupies somewhat more rolling and narrower ridges and steeper

slopes, and it is, therefore, naturally better drained than the typical soil. For this reason, crops can be planted somewhat earlier on it than on the typical soil. About 20 percent of this gravelly land is under cultivation, and the percentages planted to the different crops are about the same as on typical Granville very fine sandy loam. The soil treatment, fertilization, crops, and crop yields are about the same as on the typical soil. Soil of this phase is somewhat more susceptible to erosion than Granville very fine sandy loam because of its more rolling and steeper relief.

Soil of the gravelly phase occurs only in the northeastern part of the county. Large areas are developed in the vicinities of Sanford, Colon, Olives, and Memphis Church, and smaller areas are scattered throughout the northeastern part.

Alamance gravelly silt loam.—The surface soil of Alamance gravelly silt loam is light-gray or grayish-yellow smooth floury silt loam, which ranges in thickness from 6 to 13 inches. On the surface and in the soil are numerous flat smooth reddish-brown slate gravel and in places angular quartz gravel, which comprise from 15 to 50 percent of the soil mass. The subsoil is yellow friable silty clay loam which in most places passes into yellow friable silty clay at a depth ranging from 15 to 22 inches, and it continues to a depth ranging from 30 to 38 inches. The lower part of the subsoil in places is mottled yellowish-brown, gray, and red friable silty clay. Soft decomposed yellowish-brown slate rock underlies the subsoil.

In some of the sloping areas the underlying rock formation is near the surface and in places outcrops. In some flatter areas the soil is poorly drained, and the subsoil is mottled brownish yellow, whitish yellow, and gray. In such places the subsoil is plastic and much heavier than the typical subsoil of Alamance gravelly silt loam. These heavy-subsoil areas are Orange silt loam, and they have been included with this soil as mapped, because of their small extent. Small areas of Georgeville gravelly silt loam, which were too small to indicate on the soil map, are included also. Alamance gravelly silt loam occurs only in the northern part of the county along United States Highway No. 1.

The relief ranges from nearly flat to strongly rolling. Natural drainage is good, except in areas near the sources of streams. The soil is very deficient in organic matter and has a tendency to run together and puddle when wet. It is very dusty when dry.

This soil is not extensive, and it is unimportant in the agriculture of the county. Only a very small proportion of the land is under cultivation, but a rather large area is used for pasture. The crops grown are the same as those on Georgeville gravelly silt loam, but a slightly larger proportion of the land is planted to tobacco and a smaller proportion to small grain.

Soil management and fertilizer treatment are similar to those practiced on Georgeville gravelly silt loam, but crop yields are slightly lower than on that soil. This soil is one of the best in the State for the production of lespedeza.

Altavista very fine sandy loam.—The surface soil of Altavista very fine sandy loam is gray or grayish-brown very fine sandy loam to a depth ranging from 7 to 15 inches. The subsoil is yellow friable very fine sandy clay or clay loam to a depth ranging from 28 to 40

inches. In places the lower part of the subsoil is mottled with gray or brown. Small areas of Altavista fine sandy loam and Altavista sandy loam are included with this soil as mapped. In the northeastern part of the county north and northeast of Lee Church, the surface soil is grayish-brown silt loam, and the subsoil is yellow rather heavy clay which is mottled gray and yellow at a depth ranging from 20 to 25 inches. These heavy areas are closely associated with Roanoke silt loam. In places near the uplands, some colluvial material has been washed from the slopes and deposited on this soil.

Altavista very fine sandy loam is not extensively developed. The largest areas are along Deep River in the vicinities of Bethlehem Church and Cumnock and northeast and east of Lee Church. Two small bodies lie along Upper Little River near the Harnett County line. This soil occupies the second bottoms of the larger streams, and in some places it is subject to occasional overflows by flood waters. The relief ranges from level to gently undulating, and the surface slopes gradually toward the streams. The land is well drained except in flat places near areas of Roanoke silt loam.

Although this soil is not extensive, it is agriculturally important. Approximately 75 percent of it is cultivated. The principal crops are corn and cotton, and the minor crops are wheat, oats, vetch, and tobacco. Cotton is planted on about 35 percent of the land under cultivation and corn on about 40 percent. The rest is planted to wheat, oats, vetch, tobacco, and hay crops. Cotton is fertilized with from 300 to 600 pounds an acre of 3–8–3 or 4–10–4 fertilizer, and it yields from one-half to 1 bale an acre. Corn is fertilized with from 200 to 600 pounds an acre of a 3–8–3 or 4–10–4 mixture, and some farmers give the crop a side dressing of small quantities of nitrate of soda. Yields of corn range from 20 to 40 bushels an acre. Wheat yields from 8 to 20 bushels, depending on the amount of fertilizer applied. Without fertilizer, cotton yields one-eighth of a bale an acre and corn from 10 to 20 bushels.

Altavista very fine sandy loam, high-terrace phase.—Altavista very fine sandy loam, high-terrace phase, differs from typical Altavista very fine sandy loam mainly in that it is developed on high terraces which range in elevation from about 50 to 100 feet above the stream bottoms. Owing to its high position and greater friability, drainage is better developed than in the typical soil. The relief ranges from gently rolling to sloping. In places a few rounded quartz gravel are scattered over the surface and mixed with the soil.

The kinds of crops grown, fertilization, and crop yields are about the same for this soil as for typical Altavista very fine sandy loam. Probably more tobacco is grown than on the typical soil. Soil of this phase is inextensive. The largest areas lie east of the Carbonton power plant, and at Bethlehem Church. Approximately 85 percent of the land is under cultivation.

LIGHT-COLORED SOILS WITH RED SUBSOILS

The light-colored soils with red subsoils occupy a combined area of 97.8 square miles, or 38.2 percent of the total area of the county. These soils are distributed throughout the northwestern half, and

some are developed in the southeastern half. The surface layers are light gray or grayish yellow and are sandy and silty in texture. The subsoils are for the most part red stiff brittle clays or silty clays. In places considerable gravel is scattered on the surface and mixed with the surface soil. The relief ranges from almost level to hilly near some of the streams.

All these soils are well drained. They are subject to sheet erosion, some of them to gullying. As the heavy clay subsoils are almost everywhere near the surface, they do not allow rapid downward passage of drainage water; therefore, when a larger amount of rain falls than can be readily absorbed, the water moves rapidly off the surface, causing sheet erosion and gullying. On many of the areas having a gradient as low as 3 percent, terraces are necessary to protect the land from erosion.

A large proportion of these soils is forested with pine and oak, together with some maple and hickory, but most of the merchantable timber has been removed. Probably 30 percent of the total area of these soils is farmed or in pasture. The soils are used mainly for the production of corn, cotton, and wheat, and a small proportion of the land is devoted to the production of oats, hay, tobacco, and sweetpotatoes. Cotton and tobacco are better suited to these soils than to the associated red soils. These soils are also easier to handle, and crops mature earlier on them than on the red clay soils.

Wadesboro silt loam.—The 5- to 12-inch surface soil of Wadesboro silt loam consists of gray or grayish-yellow mellow silt loam. In places it is very fine sandy loam. The subsoil is dark-red, brick-red, or Indian-red friable silty clay or clay loam to a depth of about 38 inches, where it is underlain by purplish-red and in places streaked yellow and gray soft decomposed sandstone or shale. On some slopes the surface soil is much sallower and consists of reddish-brown silt loam ranging from 3 to 6 inches in thickness. Included with mapped areas of this soil are a few small bodies of red silty clay loam. On some ridges and near the sources of drainageways some smooth sandstone gravel and some larger pieces of sandstone occur on the surface. In some places the subsoil grades into decayed sandstone or shale at a depth ranging from 28 to 34 inches.

Wadesboro silt loam is not so extensive as some of the other Wadesboro soils, but it is important agriculturally. Most of this soil occurs between Sanford and the Moore County line north of Center Church, and small areas are scattered throughout the northern and northwestern parts of the county. This soil occupies interstream divides and slopes leading to drainageways. The relief ranges from gently rolling to strongly rolling, and drainage, both surface and internal, is in most places good, but on the steeper slopes surface drainage is excessive. Surface drainage waters erode the soil very easily, even on the gently rolling areas, and strip cropping or terracing is necessary to protect the land from damage.

About 40 percent of this soil is under cultivation, and corn, cotton, tobacco, wheat, and oats are the chief crops. Sweetpotatoes, potatoes, vegetables, and fruits are produced for home consumption. Approximately 40 percent of the cultivated land is planted to cotton, 30 percent to corn, and 20 percent to wheat. Cotton receives from 200 to 600 pounds of 2–8–2 or 4–10–4 fertilizer an acre, and it yields

from one-fourth to three-fourths of a bale of cotton an acre. Corn is fertilized with from 100 to 400 pounds of a 2–8–2 or 4–8–4 mixture and yields from 10 to 25 bushels. Wheat is generally top-dressed in the spring with moderate quantities of nitrate of soda, and this crop yields from 5 to 20 bushels. Without fertilizer corn yields from 2½ to 10 bushels, cotton about one-fourth of a bale, and wheat about 5 bushels. Tobacco receives from 500 to 1,000 pounds of 2–8–2 or 4–10–6 fertilizer and yields from 600 to 1,000 pounds. The grade is not so good as that of the tobacco produced on soils with light surface soils and yellow friable subsoils. Tobacco is planted on the areas having the thickest surface layers.

Wadesboro gravelly silt loam.—The surface soil of Wadesboro gravelly silt loam is gray or grayish-yellow mellow silt loam or very fine sandy loam, ranging in thickness from 6 to 10 inches. Scattered over the surface and intermixed with the surface soil are numerous angular quartz gravel and sandstone fragments which comprise from 15 to 50 percent of the soil mass. The presence of so large a quantity of gravel differentiates this soil from Wadesboro silt loam. The subsoil is deep-red or brick-red friable silty clay to a depth of about 34 inches, and it is underlain by soft decayed purple shale or brown sandstone material. As within mapped areas of Wadesboro silt loam, small areas of red silty clay loam have developed on ridges and near sources of small drainageways. On the surface in some places are large pieces of sandstone, and in some places the subsoil grades into decomposed sandstone or shale at a depth ranging from 25 to 31 inches. This soil warms up earlier in the spring and, for this reason, is more desirable for tobacco, cotton, and corn than Wadesboro silt loam.

Most of Wadesboro gravelly silt loam is developed in a northeast-southwest belt across the central part of the county, and small areas are scattered throughout the northwestern half.

The relief ranges from gently rolling to strongly rolling, the most rolling areas being near streams. Both surface and subsurface drainage are good, but in places surface drainage is too rapid. Unless carefully managed, this soil is subject to severe erosion, even on the gently sloping areas.

This soil is important agriculturally, and about 30 percent of it is under cultivation. Approximately 40 percent of the cultivated land is planted to cotton, 35 percent to corn, 10 percent to wheat, 10 percent to oats, and 5 percent to tobacco. Crop yields and fertilizer treatment are practically the same as for similar crops on Wadesboro silt loam.

Wadesboro gravelly silt loam, mixed phase.—Wadesboro gravelly silt loam, mixed phase, includes areas of Wadesboro gravelly silt loam and Granville gravelly silt loam which are so small and so intricately mixed that it is impossible to indicate each area on a small-scale map. As a larger proportion of these soil areas is Wadesboro gravelly silt loam, all the soil is classed as Wadesboro gravelly silt loam, mixed phase.

The 4- to 10-inch surface soil ranges from light-gray to light-red silt loam. On the surface and intermixed with the surface soil are many sandstone fragments and, in places, quartz gravel. In small areas in the western and northwestern parts of the county sandstone

rocks are so numerous on the surface that they interfere with cultivation.

The subsoil of the areas with a red surface soil is brick-red or yellowish-red friable silty clay, and the subsoil of the areas with a light-gray surface soil is yellow or reddish-yellow friable silty clay. The subsoil continues to a depth ranging from 28 to 38 inches, where it passes into soft decayed sandstone and shale material. In some places the underlying brown sandstone lies near the surface, and in a few places it outcrops.

The mixed phase of Wadesboro gravelly silt loam is rather extensive in the northwestern half of the county and is closely associated with the other Wadesboro soils and Granville very fine sandy loam. The relief ranges from gently rolling to strongly rolling. The strongly rolling areas are most prominent near streams.

On the smoother areas of this soil the crops grown, fertilizer treatment, and crop yields are practically the same as on Wadesboro gravelly silt loam. Probably 50 percent of the land is under cultivation, and about 30 percent of the cultivated area is devoted to corn, 20 percent to cotton, 20 percent to wheat, 10 percent to oats, 10 percent to tobacco, and 10 percent to such crops as potatoes and other vegetables.

Cecil fine sandy loam.—The surface soil of Cecil fine sandy loam consists of a 3- or 4-inch layer of light-gray fine sandy loam underlain by grayish-yellow friable fine sandy loam which continues to a depth of 8 or 10 inches, and this, in turn, is underlain by a reddish-yellow or yellowish-red friable fine sandy clay layer from 2 to 4 inches thick. The subsoil is stiff brittle red clay to a depth of about 30 inches, where it passes into lighter red and more friable clay. The subsoil, at a depth of about 40 inches, is underlain by soft friable decayed rock material. Finely divided flakes of mica are common in the subsoil. In places, many angular quartz gravel and stones are scattered over the surface, but such areas are not sufficiently large to show on the map. The underlying rock in some places outcrops on the surface, and in other places fragments of granitic rock are scattered on the surface.

Cecil fine sandy loam is developed in the southeastern part of the county, bordering on Upper Little River and Gasters Creek, and also in several areas northeast of Salem Church. The relief ranges from gently rolling to hilly and becomes somewhat broken near the streams. Both surface and subsurface drainage are good, and on the steeper slopes surface drainage is excessive. In most places terracing is necessary for the prevention of erosion.

This soil is not very important agriculturally, mainly because of its small extent and, in places, its broken relief. Only about 15 percent of the land, which comprises the more nearly level areas, is under cultivation. About 33 percent of the cultivated area is planted to cotton, 33 percent to corn, 20 percent to wheat, and the rest to garden vegetables, oats, hay, and potatoes.

Corn receives from 100 to 500 pounds an acre of 2–8–2 or 4–10–4 fertilizer and yields from 10 to 35 bushels; and cotton receives from 200 to 600 pounds of 2–8–2 or 4–10–4 and yields from one-fourth to one-half bale. Wheat receives from 100 to 300 pounds of 3–8–3 or 4–8–4 fertilizer and, by some farmers, a top dressing of moderate

quantities of nitrate of soda, and it yields from 5 to 20 bushels. Wheat is not fertilized by some farmers, and yields are much lower.

Included with this soil as mapped, because of their slight extent, are two areas of Appling sandy loam, one of which is 1½ miles northeast of Baptist Chapel and the other 2 miles northeast of Moores Union Church. The Appling sandy loam areas have a grayish-yellow sandy loam surface soil and a yellowish-red friable sandy clay or clay subsoil.

Cecil fine sandy loam, gravelly phase.—Cecil fine sandy loam, gravelly phase, differs from typical Cecil fine sandy loam mainly in that from 15 to 50 percent of the surface soil consists of angular quartz gravel, and a few quartz stones are scattered over the surface. The surface soil also varies more greatly in thickness than typical Cecil fine sandy loam. This layer is from 4 to 15 inches thick. In some places the red clay subsoil is exposed in spots on the surface, and small areas of Cecil clay loam, gravelly phase, are included with the soil of this phase as mapped.

The gravelly phase of Cecil fine sandy loam occurs only in the eastern part of the county. The largest areas are developed in the vicinity of Poplar Springs Church and along Fall, Patchet, and Carrs Creeks. Smaller bodies are elsewhere in this part of the county.

This soil has in general the same kind of surface features as typical Cecil fine sandy loam. Drainage is generally good and is excessive in the more rolling areas. The proportion of land under cultivation is slightly smaller than that of typical Cecil fine sandy loam, but the percentage planted to different crops is about the same. The soil management, fertilizer treatment, crops, and yields are about the same on this soil as on typical Cecil fine sandy loam.

Georgeville gravelly silt loam.—The surface soil of Georgeville gravelly silt loam is light-gray or grayish-yellow silt loam which in most places becomes yellowish red at a depth of 3 or 5 inches and continues so to a depth ranging from 6 to 12 inches. On the surface and mixed with the surface soil are large quantities of white angular quartz gravel ranging in diameter from one-eighth to 1 inch. In some places the gravel consists of somewhat rounded or broken platy pieces of slate. The gravel content of the soil ranges from 15 to 35 percent. The subsoil is red or light-red friable brittle smooth silty clay to a depth of about 30 inches, where it becomes lighter in color and in structure. At a depth of about 40 inches the subsoil is underlain by brownish-red, yellow, and purple soft smooth decomposed slate material. Variations in the soil are noticeable in many places. On some knolls, slopes, and sharp ridges, the surface mantle in places has been removed by erosion, and "galled spots" of red clay appear. The subsoil in many places along United States Highway No. 1 is yellowish-brown or dark-red, faintly mottled with yellow, friable clay to a depth of about 30 inches. This is underlain by streaked yellow, deep-red, and very light gray smooth friable partly decomposed slate material. Soil with these variations resembles Herndon gravelly silt loam mapped in other counties. Also included with this soil as mapped are small areas of Georgeville stony silt loam and Alamance gravelly silt loam, which were too small to be shown separately. In some places on the slopes the decomposed slate rock is near the surface.

Practically all of Georgeville gravelly silt loam occurs in the northern part of the county, along or near United States Highway No. 1. This soil is developed mainly on interstream ridges and to less extent on slopes. The relief ranges from gently rolling to strongly rolling. Surface and internal drainage are good, but on the steeper slopes surface run-off is excessive.

From 20 to 25 percent of the land is under cultivation. The principal crops are corn, cotton, and wheat, and other crops are oats, tobacco, hay, vegetables, and flowers. About 30 percent of the cultivated land is planted to corn, 30 percent to wheat, 20 percent to cotton, and the rest to miscellaneous crops.

Corn is fertilized with from 100 to 500 pounds an acre of a 2–8–2 or 4–10–4 fertilizer and is side-dressed by some farmers with a moderate quantity of nitrate of soda. With fertilizer yields range from 10 to 35 bushels an acre, and without fertilizer yields may be as much as 10 bushels. Wheat receives about 300 pounds an acre of 2–8–2 or 3–9–3 fertilizer and is top-dressed in the spring by some farmers with a light application of sulphate of ammonia. With such treatment wheat yields from 8 to 20 bushels an acre, and without fertilizer the yields range from 4 to 8 bushels. Cotton is given an acre application of from 200 to 600 pounds of 2–8–2 or 4–10–4 fertilizer and yields from one-fourth to one-half of a bale. Without fertilizer cotton yields from one-eighth to one-fourth of a bale. Other crops produce from fair to good yields, depending on the quantity of fertilizer applied and the condition of the soil.

Bradley sandy loam.—The 3- or 4-inch surface layer of Bradley sandy loam consists of light-gray or gray light sandy loam. It is underlain by grayish-yellow or pale-yellow sandy loam to a depth ranging from 8 to 20 inches. The subsoil is light-red, brick-red, or red friable silty clay or stiff brittle clay, which continues to a depth of about 35 inches, where it is underlain by soft decomposed rock material. The surface layer of this soil resembles that of Norfolk sandy loam, but the subsoil is very much like the subsoil of the Wadesboro or Cecil soils.

This soil is developed on the border between the coastal-plain and the piedmont-plateau sections, where a thin layer of coastal-plain material is spread over the piedmont-plateau soil formations.

Because of their small extent, areas of Chesterfield sandy loam, Bradley sandy loam, gravelly phase, Norfolk sandy loam, and Cecil fine sandy loam are included with this soil as mapped.

The largest areas of Bradley sandy loam occur in the central and southern parts of the county. An area of this soil along Cranes Creek extends from Center Church southeastward to the county line. Bodies are along Upper Little River, Mulatto Branch, Little Juniper Creek, and Gasters Creek and around Morris Pond.

The relief ranges from gently to strongly rolling. Owing to the rolling relief and the sandy texture of the soil, drainage is good, but in places on the steeper slopes surface drainage is excessive.

The total acreage of Bradley sandy loam is not large, but the soil is fairly important agriculturally, and about 15 percent of it is under cultivation. Cotton and corn are the principal crops, and some tobacco, oats, wheat, sweetpotatoes, and garden vegetables are grown. Cotton is planted on about 35 percent of the cultivated land, corn

on 30 percent, wheat on 10 percent, oats on 18 percent, and tobacco on 5 percent. Cotton is fertilized with from 200 to 600 pounds an acre of 3–8–3 or 4–10–4 fertilizer, and it yields from one-fourth to three-fourths of a bale. Corn receives from 200 to 600 pounds of 2–8–2 or 4–10–4, and it is side-dressed by some farmers with moderate quantities of nitrate of soda. The yields range from 15 to 35 bushels. Tobacco is fertilized with from 600 to 1,000 pounds of a 3–8–3 or 4–10–6 mixture, and yields range from 600 to 1,000 pounds. Wheat, oats, and vegetables produce good yields.

Bradley sandy loam, gravelly phase.—The surface soil of Bradley sandy loam, gravelly phase, is gray or grayish-yellow light sandy loam ranging from 5 to 8 inches in thickness. Scattered over the surface and intermixed with the surface soil are large quantities of angular and rounded quartz gravel which comprise from 20 to 60 percent of the soil mass. The presence of these gravel constitutes the main difference between the surface soil of this soil and typical Bradley sandy loam. The subsoil is light-red or brick-red friable or stiff but brittle clay which is underlain by soft decayed rock at a depth of about 35 inches. Like typical Bradley sandy loam, the surface soil is similar to that of the Norfolk soil, and the subsoil resembles that of the Wadesboro or Cecil soils. A few narrow strips of Chesterfield sandy loam, gravelly phase, are included with this soil as mapped.

Bradley sandy loam, gravelly phase, is developed in a belt across the south-central part of the county. The largest areas occur south and southwest of Tramway, west, south, and east of Jonesboro, and in the vicinity of Baptist Chapel.

The relief and drainage conditions are similar to those of typical Bradley sandy loam; and the soil management, fertilizer treatment, crops, and yields are about the same as for the typical soil.

Ruston gravelly sandy loam.—The 10- to 15-inch surface soil of Ruston gravelly sandy loam consists of gray or grayish-brown medium loamy sand or light sandy loam. From 15 to 50 percent of the content of the surface soil is rounded quartz gravel ranging in diameter from one-fourth inch to 2 inches. The subsoil is yellowish-red or reddish-yellow friable sandy clay which continues to a depth of 38 or more inches. This layer also contains some rounded gravel.

Practically all this soil has developed in the vicinity and northeast of Broadway. The soil occupies ridges and slopes approaching drainageways. The relief ranges from level to rolling. Owing to this favorable relief and to the porous structure of the soil, both surface and internal drainage are good.

Approximately 65 percent of the land is under cultivation and is used for general farming. Cotton, corn, and tobacco are the main crops, and other crops are wheat, oats, sweetpotatoes, and garden vegetables. Cotton yields from one-half to three-fourths of a bale an acre, corn 15 to 30 bushels, and tobacco 600 to 900 pounds. About the same cultural methods and fertilizer treatment are followed on this soil as on Norfolk sandy loam.

Ruston sandy loam, deep phase.—The chief difference between Ruston sandy loam, deep phase, and Ruston gravelly sandy loam is that the deeper soil does not contain any gravel in the surface soil or subsoil and that the surface soil is thicker, ranging from 18 to

28 inches in thickness. The subsoil is slightly more friable. The relief ranges from undulating to rolling. About 25 percent of the land is under cultivation. The crops, yields, and fertilizer treatment are similar to those on Norfolk sandy loam, deep phase, and the percentage of the land planted to each crop is about the same.

RED SOILS WITH RED HEAVY SUBSOILS

The group of red soils with red heavy subsoils includes the red clay soils of the uplands and the brown soils of the terraces and first bottoms. The combined area of the soils included in this group is 22.1 square miles, or 8.6 percent of the total area of the county. The Cecil, Georgeville, and Davidson soils are developed on the uplands in the piedmont-plateau part of the county, the Wickham soils on the terraces, and the Congaree soils on the first bottoms.

The soils of this group, with the exception of the Wickham and Congaree, are the heaviest in texture and structure of the soils in this county. These soils are inherently the most fertile, but they may not produce such profitable crops as some of the less fertile soils, because they are not suited to the production of the cash crops commonly grown. As the red clay soils are heavy, they are difficult to till and require stronger work animals and heavier machinery, particularly in breaking the soil to sufficient depth, than any other soils in the county. The Wickham and Congaree soils are fairly easy to till, especially the Wickham.

The Cecil, Davidson, and Georgeville soils have developed on smooth to rolling ridges and fairly steep slopes, the Wickham soils occupy areas ranging from almost level to rolling, and the Congaree soil occurs only in the almost level first bottoms. Surface drainage on the Cecil, Davidson, and Georgeville soils is rapid and in places has carried away some of the surface soil. The movement of soil moisture through these soils is comparatively slow. Surface and internal drainage of the Wickham soils are adequate in most places. The Congaree soil for the most part is well drained, but on flats and in depressions drainage is poorly established.

Considered as a whole, these soils, if properly managed, would be the best in the county for the production of small grains, clover, and vetch. The Congaree soil is the best for the production of corn, and the Wickham soils are well suited to cotton, corn, and oats.

Cecil clay loam.—The 5- or 6-inch surface soil of Cecil clay loam is red or reddish-brown clay loam. It is underlain by a red stiff but brittle crumbly clay subsoil which continues to a depth of 38 or more inches. In the lower part the color is lighter and the structure more open than in the upper part. The subsoil is underlain by soft decayed rock material. Some of the more level areas include spots of gray fine sandy material to a depth of 3 or 4 inches. In most places the subsoil contains some flakes of mica, and in places it grades into the decomposed parent rock at a depth of about 30 inches.

Cecil clay loam is developed chiefly in the eastern and southeastern parts of the county. The largest areas are 1 mile northeast of Salem Church and along Upper Little River and Patchet Creek near the Harnett County line. This soil occupies ridges, slopes, and breaks near some of the streams. The relief ranges from rolling to hilly and broken, and drainage is good in places excessive.

About 15 percent of this soil is cultivated, and probably 40 percent of the cultivated land is planted to corn, 30 percent to wheat, 15 percent to cotton, 5 percent to oats, and 10 percent to other crops. Corn receives from 100 to 400 pounds an acre of a 2–8–2 or 4–10–4 fertilizer and is side-dressed by some farmers with nitrate of soda. The yields range from 15 to 40 bushels an acre. From 100 to 300 pounds of fertilizer is applied to wheatland at sowing time, and a top dressing of nitrate of soda is applied in the spring. The yields range from 8 to 25 bushels, depending on the quantity of fertilizer applied. Cotton receives an application of 200 to 600 pounds of 2–8–2 or 4–10–4 fertilizer and yields from one-fourth to three-fourths of a bale. Yields of other crops are fair.

Davidson clay loam.—The surface soil of Davidson clay loam consists of reddish-brown or brownish-red clay loam ranging from 5 to 9 inches in thickness. The subsoil is maroon-red or deep-red stiff smooth clay extending to a depth of several feet. From very small areas the clay loam surface soil has been removed by erosion, and the red heavy clay is exposed. Small bodies of the Georgeville soils are included with this soil as mapped. A few quartz gravel and fragments of dark-colored rocks are scattered over the surface in places.

The total area of Davidson clay loam is very small, and the soil is of little importance in the agriculture of the county. It occupies several small areas in the northern part. The largest bodies are immediately north of Blackwell Chapel, three small areas are south of Woodward Bridge, and two lie north of Euphonia Church in the western part. The relief ranges from rolling to strongly rolling, and drainage is everywhere good.

Davidson clay loam is a fertile soil, and about 40 percent of it is under cultivation and in pasture. Corn, wheat, clover, and oats are the principal crops. The soil management and fertilizer applications are practically the same as for crops on Cecil clay loam, but crop yields are somewhat higher. This soil ranks as the best grain, clover, and alfalfa soil in other counties of the State, where it is more extensively developed.

Georgeville gravelly silty clay loam.—The 5- to 8-inch surface soil of Georgeville gravelly silty clay loam is brownish-red or red silty clay loam or clay loam. Scattered over the surface and mixed with the surface soil are large quantities of angular quartz gravel and smooth somewhat rounded brown slate gravel, which render the soil distinctly gravelly. The subsoil is red friable silty clay or clay to a depth of 40 or more inches. The material in this layer is lighter in color and structure in its lower part and is underlain by soft decomposed slate. Areas of Georgeville silty clay loam, silt loam, and gravelly silt loam have been included with this soil as mapped.

Most of this soil is developed on slopes in the northern part of the county, and the relief ranges from rolling to strongly rolling and broken. Surface drainage is good in most places, but on the steeper slopes is much more rapid than elsewhere.

Only a small proportion of the land is cultivated. The crops grown, fertilizer treatment, and crop yields are about the same as on Cecil clay loam.

Wickham sandy loam.—The surface soil of Wickham sandy loam is light-brown or brown mellow medium light sandy loam to a depth ranging from 6 to 15 inches. The subsoil is reddish-yellow or brownish-red friable sandy clay to a depth of 38 or more inches. In places the surface soil is grayish yellow, and in other places it is reddish brown, particularly in the vicinity of Cumnock. Small spots of Wickham fine sandy loam, Wickham very fine sandy loam, and Altavista very fine sandy loam are included with this soil as mapped. The subsoil of the included Wickham very fine sandy loam consists of fairly heavy clay, much heavier than typical for this soil. The areas with heavy subsoils are developed near areas of Altavista very fine sandy loam and Roanoke silt loam.

Wickham sandy loam is developed on some of the second bottoms along Deep and Cape Fear Rivers. High flood waters sometimes overflow the land in places. This soil occurs only in the northwestern and northern parts of the county. The largest bodies are in the vicinities of Cumnock and the Carbonton power plant, and north of the Norfolk Southern Railroad bridge across Cape Fear River. A very small area is on the north side of Upper Little River at the Harnett County line. The relief ranges from almost level to gently undulating. The land is well drained, except in small seepy spots near the uplands.

This soil is not very extensive, but it is important agriculturally. About 90 percent of it is under cultivation, mainly to corn, cotton, and wheat. Probably 35 percent of the cultivated area is planted to corn, 35 percent to cotton, 10 percent to wheat, 5 percent to oats, and 10 percent to hay and other crops. Corn receives from 100 to 400 pounds an acre of 2–8–2 or 4–8–4 fertilizer and yields from 20 to 40 bushels. Cotton with an application ranging from 200 to 600 pounds of 2–8–2 or 4–10–4 fertilizer yields from one-fourth to 1 bale. With from 100 to 300 pounds of the same kind of fertilizer, wheat yields from 10 to 35 bushels. A top dressing of nitrate of soda is usually applied to wheat in the spring.

Wickham sandy loam is developed on some of the second bottoms the high-terrace phase of Wickham sandy loam is grayish-brown or brown friable sandy loam ranging from 6 to 15 inches in thickness. It contains a rather large quantity of rounded quartz gravel. The subsoil is similar to that of typical Wickham sandy loam. The main difference between this soil and the typical soil is that the phase is developed at a higher elevation, or from 50 to 100 feet above that of the typical soil. The relief ranges from gently rolling to rolling, and drainage is good. As a result of erosion, the brownish-red subsoil is exposed in places.

This soil occurs only in the northwestern part of the county along Deep River. Soil management, fertilizer treatment, and crop yields are practically the same as on the typical soil. Slightly more tobacco and cotton and slightly less corn are grown on this soil than on typical Wickham sandy loam. About 90 percent of the land is under cultivation.

Wickham very fine sandy loam.—The 8- to 12-inch surface soil of Wickham very fine sandy loam is brown or light-brown very fine sandy loam. It contains a noticeable quantity of silt, although it is mellow, friable, and easy to till. It is underlain by yellowish-brown or reddish-brown moderately stiff brittle and crumbly clay loam or

clay. In most places, at a depth ranging from about 4 to 5 feet, is lighter colored and lighter textured clay, but in some places, particularly where this soil adjoins Roanoke silt loam, the subsoil, at a depth ranging from 30 to 40 inches, is mottled gray, yellow, and brown silty clay or clay.

Several small areas of Wickham very fine sandy loam are developed on the terraces, or second bottoms, along Deep and Cape Fear Rivers. Some of the largest bodies lie southeast of Lockville Dam, and several areas are in the vicinity of Memphis Church. Areas of this soil are surrounded by Altavista very fine sandy loam or by Roanoke silt loam. This soil has an almost level, undulating, or very gently sloping relief, and it is everywhere well drained. It occupies a slightly higher position than the soils with which it is associated.

Practically all the land is under cultivation or is used for pasture. It produces good yields of corn, hay, wheat, and oats. It is considered one of the high-grade agricultural soils and is capable of being built up to and easily maintained in a high state of productivity.

Congaree silt loam.—The surface soil of Congaree silt loam is light-brown or dark-brown silt loam which ranges from 8 to 18 inches in thickness. The subsoil is brown silt loam or silty clay loam to a depth of 40 or more inches. In places the subsoil, at a depth ranging from 30 to 35 inches, is mottled yellow, brown, and gray silty clay.

Narrow strips of Congaree fine sandy loam are included with this soil as mapped. Along the streams which flow through the brown-sandstone and purple-shale areas, the surface soil is dark reddish brown, and the subsoil is reddish brown rather than brown, owing to deposits of red soil material derived from the nearby slopes. In some poorly drained areas the surface soil consists of dark-gray or grayish-brown silt loam ranging from 8 to 12 inches in thickness. It is underlain by a dark steel-gray or drab compact silty clay subsoil which in most places is mottled with yellow and rust brown. These are areas of Wehadkee silt loam which, on account of its small extent, was included with Congaree silt loam in mapping. Spots of meadow also are included.

Congaree silt loam is developed in rather large areas along Cape Fear River north of Avents Bridge, along Deep River, and along Lick Creek. Other areas border all the larger streams in the northern and eastern parts of the county. Bodies of this soil range from a few feet to more than a mile in width. The land is subject to occasional overflow. Drainage is fair in most places but is inadequate in flats and depressions.

About 50 percent of this soil is under cultivation, and small areas are used for pasture. Approximately 75 percent of the cultivated land is planted to corn and the rest to wheat, oats, and hay. Corn yields from 25 to 50 bushels an acre without the aid of fertilizer. In some fields a top dressing of nitrate of soda is applied to the crops.

MISCELLANEOUS LAND TYPES

The combined area of the miscellaneous land types is 57.1 square miles, or 22.5 percent of the total area of the county. Owing to low productivity, steepness of slope, stoniness, eroded condition, imper-

viousness of subsoil, or inadequate surface drainage, only a comparatively small proportion of these soils is used for growing crops. Although more of the smoother and less stony areas could be utilized for the production of crops, the probability of any extensive use of these soils for crops is remote, because their unfavorable physical condition would prevent them from successfully competing with soils having better natural advantages. A large part of these soils once supported a forest growth of pine and oak, but most of the original timber has been removed, and the present trees are mainly second-growth pines or oaks. As the soils of this group hold little promise for profitable production of crops, their best use is for forestry. Roanoke silt loam and meadow could be used for summer pasture land, and, if these soils were reclaimed by ditching and draining, some areas would produce fair yields of hay and corn.

Norfolk sand, hilly phase.—The hilly phase of Norfolk sand, to a depth ranging from 3 to 6 inches, is gray, light-gray, or grayish-yellow incoherent sand, and below this depth the soil material is yellow or pale-yellow loose sand which continues without change to a depth of several feet.

This soil is developed in comparatively small areas on steep slopes near drainageways in the southern part of the county. The largest are south and west of Lemon Springs.

Owing to the open structure of the soil, downward drainage is good, but, because of the steep and hilly relief, surface run-off of rain water is very rapid in many places. On account of unfavorable surface features and low productivity, the soil is not used to a great extent for crops. It supports a growth of blackjack oak, scrub oak, and a few pine trees and an undergrowth of wire grass. The best use of this hilly soil is for forestry.

Hoffman sandy loam.—The surface soil of Hoffman sandy loam consists of a gray loamy sand layer from 3 to 5 inches thick, underlain by a pale-yellow sandy loam or loamy sand layer ranging from 3 to 17 inches in thickness. The subsoil consists of a 3- to 6-inch layer of dingy-yellow or brownish-yellow friable sandy clay underlain by mottled red, yellow, pink, and gray rather heavy sticky sandy clay material which continues to a depth of 38 or more inches. In some places the lower subsoil layer consists of material resembling decomposed feldspar, and it contains finely divided flakes of mica. In nearly level areas, the subsoil is yellow or reddish-yellow friable sandy clay which, at a depth ranging from 22 to 30 inches, grades into mottled pink and gray sticky soil material. In most places there is no subsoil, and the yellow surface layer directly overlies the mottled red, pink, yellow, and gray sticky soil material. Fragments of reddish-brown sandstone are conspicuous on the surface in many places. Included with mapped areas of this soil are bodies of gravelly soil and Norfolk sandy loam, deep phase, which were too small to show on the soil map.

Hoffman sandy loam occurs only in the coastal-plain section of the county, and rather large areas have developed, mainly on slopes leading to streams. The areas of this soil range from narrow strips to bodies as much as a mile wide. Practically all of the soil occurs in the extreme southern part of the county south of Lemon Springs. It occupies gently rolling ridges and rolling, hilly, and

broken stream slopes. Surface and internal drainage are good, but, owing to steepness of the slope in many places, surface run-off is rapid.

Although the total acreage of this soil is 16.3 square miles, the land is of comparatively little agricultural importance, mainly because of the steep slopes, and only about 5 percent of it is under cultivation. Cotton and corn are the principal crops, and tobacco, oats, rye, wheat, peaches, dewberries, and vegetables are minor crops. The crops are grown on the smooth or gently rolling areas, and yields are about the same as for similar crops on Norfolk sandy loam, deep phase. Fertilizer treatment, both in kind and quantity, is similar to that for crops on Norfolk sandy loam. Under present conditions forestry is the best use for Hoffman sandy loam.

Cecil fine sandy loam, stony phase.—The 3- or 4-inch surface layer of Cecil fine sandy loam, stony phase, is light-gray fine sandy loam. It is underlain by grayish-yellow friable fine sandy loam to a depth of 8 or 10 inches. The subsoil is stiff but brittle red clay to a depth of about 30 inches, where it changes to light-red friable clay. At a depth ranging from 35 to 40 inches, the subsoil grades into soft decomposed rock material. Finely divided flakes of mica are present in most places in the subsoil. Numerous quartz rock fragments, ranging from 5 to 10 inches in diameter, are scattered over the surface and embedded in the surface layer; and quartz gravel, ranging in diameter from 1 to 2 inches, are also mixed with the soil. Included with mapped areas of this soil are small bodies of Cecil fine sandy loam and Cecil clay loam, stony phase.

This soil is developed in narrow strips in the eastern part of the county. The largest areas are 2 miles east of Poplar Springs Church and along Cape Fear River at Buckhorn Dam.

The relief is strongly rolling, hilly, and broken, and surface drainage is excessive. Only a small proportion of the land is under cultivation. If the stones were picked from the smoother areas, these areas could be farmed. Practically all of this stony land should be devoted to forestry.

Cecil clay loam, stony phase.—The surface layer of Cecil clay loam, stony phase, is red or reddish-brown loam or clay loam 5 or 6 inches thick. It is underlain by red stiff but brittle crumbly clay which continues to a depth of about 30 inches where it becomes lighter in color and structure. In most places the subsoil contains some finely divided flakes of mica, and in most places it is underlain by decomposed rock at a depth ranging from 35 to 40 inches. In some of the nearly level areas, 3- or 4-inch layers of gray fine sandy material occur in spots. Scattered over the surface and intermixed with the soil is a large quantity of angular quartz rocks, ranging in diameter from 5 to 10 inches; and quartz gravel, ranging in diameter from 1 to 2 inches, also are mixed with the soil.

This soil occurs only in the eastern part of the county in the vicinities of Moores Union Church, Baptist Chapel, and Poplar Springs Church. It is developed both on ridges and slopes, and the relief ranges from rolling to hilly and broken. Drainage is well established, but surface drainage in places on the steeper slopes is excessive. Approximately the same percentage of the land is under cultivation as of Cecil clay loam, and crop yields and fertilizer treatment are practically the same on both soils.

White Store silt loam.—The surface soil of White Store silt loam is light-gray, pale-yellow, or grayish-yellow silt loam to a depth ranging from 5 to 11 inches, and it contains a few quartz gravel. The subsoil is dark-red, brownish-red purplish-red, or Indian-red heavy plastic clay to a depth ranging from 10 to 22 inches. Below the subsoil the material is drab or reddish-brown plastic clay which, below a depth of a few inches, grades into mottled grayish-blue, red, purple, and very light gray heavy plastic soil material. Locally the subsoil is mottled gray and yellow heavy plastic clay.

The soil as mapped includes small areas of White Store silt loam, gravelly phase, White Store silt loam, shallow phase, Granville very fine sandy loam, Wadesboro silt loam, Wadesboro gravelly silt loam, mixed phase, a purplish-red clay loam, and spots from which the surface mantle has been removed by erosion, leaving red clay exposed.

White Store silt loam occurs in the northeastern part of the county northeast of Sanford, at Lebanon Church, at Lee Church, and east of Osgood. The relief is that of flat or gently rolling interstream country and gentle slopes toward streams. Surface drainage is fairly good, but, because of the heavy plastic clay subsoil, internal drainage is very slow, and the more rolling or sloping areas are subject to serious erosion unless carefully managed.

Although comparatively large areas of White Store silt loam are developed in this county, probably not more than 7 percent of the land is under cultivation. Corn, cotton, wheat, and hay are the principal crops. About 40 percent of the cultivated land is planted to corn, 20 percent to wheat, 10 percent to oats, and 10 percent to hay and vegetables.

About the same kinds and quantities of fertilizer are used on this soil as on Wadesboro silt loam, but yields are not so high. The White Store soil should be used for forestry.

Wadesboro gravelly silt loam, eroded phase.—Wadesboro gravelly silt loam, eroded phase, is a soil condition rather than a soil phase, and this designation is the nearest approach to classifying the soil that can be given. This soil differs from typical Wadesboro gravelly silt loam in that the greater part of the surface soil has been removed by erosion, thereby exposing the red clay subsoil. In some places considerable gullying has taken place, and in places erosion has been so active that the entire soil has been removed, leaving the underlying brown sandstone and mudstone exposed. Outcrops of sandstone occur in some places, and sandstone fragments are scattered over the surface in other places.

The greater part of this soil is in the western and northwestern parts of the county. It is developed near the sources of small streams and on slopes leading to most of the streams in these sections. The relief ranges from strongly rolling to broken. The surface is excessively drained, and the slopes are too rolling and broken for the construction of satisfactory terraces. None of this land is under cultivation. In its present eroded condition this soil should be forested.

Roanoke silt loam.—The 6- to 12-inch surface soil of Roanoke silt loam is gray or grayish-brown heavy silt loam which, in places, contains some rust-brown or yellow mottling. The subsoil is mottled gray and yellow tough plastic clay. In some places a few brownish-red spots occur in the subsoil.

This soil is developed in several areas on the second bottoms along Deep and Cape Fear Rivers, from the Seaboard Air Line Railway southward to Bush Creek. The relief is nearly level or flat, and drainage is poor, both on the surface and through the soil. None of the land is under cultivation. If it were drained, some pasture could be grown, and some areas could be used for the production of corn.

Meadow.—Meadow includes soil that is extremely variable in color, texture, and structure, and, because of this mixed condition, it cannot be separated into definite soil types. In many places the color of the soil is brown, and the texture ranges from silty clay loam and silt loam to fine sandy loam or fine sand. Included with mapped areas of this soil are small bodies of black loam ranging in thickness from 15 to 30 inches. Had such bodies been sufficiently large, they would have been mapped as Portsmouth loam.

Meadow occupies low first bottoms along most of the streams in the southeastern half of the county. The material of which the soil is composed was washed from the uplands and deposited along streams during times of overflow. The relief is flat, and drainage is poor. Owing to its low position and the prevailingly flat surface, much of this soil is in a water-logged condition most of the year. None of the land is under cultivation, but small areas are used for pasture.

Guin soils, undifferentiated.—Guin soils, undifferentiated, include yellowish-red friable soil material intermixed with numerous rounded quartz gravel and stones. This soil is of very low agricultural value. It occupies high hills, and the relief is strongly rolling, hilly, and broken. The only area mapped is just east of Sanford near the headwaters of Lick Creek. The land supports a good forest growth, chiefly of pine. Some of this mixed soil is used for road-building material.

Rock outcrop.—Rock outcrop includes exposures of rock along Deep River at and west of Lockville Dam. It has no agricultural value.

AGRICULTURAL METHODS AND MANAGEMENT[5]

The soils of Lee County, except some of the deep sand areas and the steep and broken areas, are capable of being built up to and maintained in a fairly high state of productivity. Deep plowing is not necessary on the light sandy soils, but on the fine-textured soils in the northern part of the county it is beneficial, as it aids in the absorption of rain water and in the conservation of soil moisture. Deep plowing also helps to check soil erosion and to loosen the soil so that plant roots can penetrate the subsoil.

Many of the soils of this county are adapted to certain crops. In the piedmont-plateau section are several soils which rank high in other parts of the State in the production of particular crops. The Alamance and Georgeville soils are exceptionally well suited to the production of lespedeza without the aid of fertilizer. The Altavista and Congaree soils also give good returns of this crop. Davidson clay loam is the best soil in the State for the production of alfalfa, and the Georgeville soils produce high yields of this crop. The Davidson and Georgeville soils also rank high in the production

[5] The data in this section were furnished by the North Carolina Agricultural Experiment Station. They were compiled by E. F. Goldston.

of red clover and cotton, and they produce good crops of wheat without fertilizer. Congaree silt loam, when well drained, is one of the best soils in the State for corn and is also well suited to the production of hay and forage crops. The Granville and Alamance soils are adapted to growing bright tobacco, and the Granville soils are also suited to sweetpotatoes, velvetbeans, and vetch. The Wadesboro soils rank well in the production of cotton.

In the coastal-plain section are several soils which rank high in other parts of the State in the production of certain crops. Norfolk sandy loam and Marlboro sandy loam are the best soils in the State for cotton, peanuts, sweetpotatoes, watermelons, and cantaloups. Norfolk sandy loam and Norfolk sand rank high in the production of peaches, dewberries, and grapes. The Norfolk and Marlboro soils are also well adapted to growing bright tobacco, and the Ruston soils are suited to cotton.

The soils, with the exception of those in the first bottoms, are deficient in organic matter, and this can be supplied by growing and turning under winter cover crops of rye and oats or by growing leguminous crops, such as vetch, soybeans, clover, and cowpeas. If the legumes are cut for hay, little, if any, residue can be turned under for soil improvement; but, if the seed is harvested and the plants turned into the soil, considerable improvement in the organic-matter content and the nitrogen content of the soil should result. Where this is done, the quantity of nitrogen in the fertilizer may be reduced; and, if the practice of growing leguminous crops is continued, the seed harvested, and the residue plowed under, within a few years it may not be necessary to supply nitrogen from commercial sources.

Soil leaching is an important factor in causing a shortage of plant nutrients in the soil. Leaching occurs to a greater extent in the light sandy loam and sand soils in the southern part of the county, but it is also active in the soils in the northern part. The growing and turning under of green-manure crops, thereby incorporating organic matter in the soil, is an effective method of checking soil leaching.

By depletion of their fertility, the soils show the ill effects of growing the same crop year after year. Some farmers practice crop rotations, in order to improve the fertility of the soils, and these rotations have proved beneficial. The North Carolina Agricultural Experiment Station recommends the following rotations for the piedmont-plateau part of the county: A 3-year rotation—first year, corn for grain and soybeans for seed, turning under, or grown alone for hay, wheat or other small grain in the fall; second year, wheat or other small grain for grain, lespedeza or red clover, sown on grain land in March; third year, lespedeza or red clover for hay or turning under. A 4-year rotation—first year, tobacco, with rye sown in the fall; second year, tobacco, with redtop and other grasses sown in the fall; third year, redtop and other grasses for pasture; fourth year, redtop and other grasses for pasture. A 5-year rotation—first year, corn, for grain or silage, and soybeans for seed and turning under; second year, corn or cotton; third year, soybeans for hay, with a small grain in the fall; fourth year, small grain for grain or hay, with red clover, sweetclover, or lespedeza sown on grain land in March; fifth year, red clover, sweetclover, or lespedeza for hay, grazing, and turning under.

Crop rotations recommended for the coastal-plain section are as follows: A 3-year rotation—first year, corn for grain, with soybeans for seed or grazing, or velvetbeans for grazing, all vines to be turned under; second year, spring oats for hay, with lespedeza for hay or grazing, or soybeans for hay, seed, or grazing; third year, cotton, and Abruzzi rye, vetch, or crimson clover for turning under. Another 3-year rotation—first year, tobacco, with Abruzzi rye, vetch, or crimson clover in the fall for turning under; second year, corn for grain and velvetbeans for grazing and turning under; third year, cotton, with Abruzzi rye in the fall for turning under.

Erosion is rapidly damaging many of the soils, both by removing surface soil and by forming gullies, in places where the soils are not properly managed. It is most active on the uplands in the northern part of the county, particularly on the Georgeville, Cecil, Wadesboro, and Granville soils. Effective methods for the control of erosion include the growing of winter cover crops, contour plowing, terracing, and strip cropping. In strip cropping, rows of grass or other crops that will check erosion are employed instead of terraces. In the piedmont-plateau section, terracing or strip cropping is beneficial on slopes having a gradient as low as 5 percent; hence practically all the soils in the northern part of the county would be benefited by such methods. Terracing and strip cropping not only protect the soil from erosion, but, by allowing the rainfall to move off slowly, cause the soil to absorb more moisture and thus increase its moisture supply. Destructive soil erosion takes place as a result of using soil in ways to which it is not naturally adapted; and, in general, its control is a matter of adapting management to the particular capabilities and deficiencies of each soil type.

The soils of the piedmont-plateau section are well suited to the production of grasses and hay crops. As the county is near good markets, the raising of livestock could be followed on a much larger scale than at present, and the livestock products probably could be disposed of on nearby markets at fair profits. Much of the land not especially suited to field crops could be cleared, terraced, and sown in grasses, thus providing good summer pasture.

The following grass mixtures for permanent pastures are recommended by the North Carolina Agricultural Experiment Station for soils in the piedmont-plateau section: Redtop, 10 pounds; orchard grass, 12 pounds; red clover, 5 pounds; and white clover, 3 pounds, making a total seeding of 30 pounds to the acre. Another permanent pasture-grass mixture is orchard grass, 10 pounds; tall oatgrass, 10 pounds; Kentucky bluegrass, 5 pounds; and red clover, 5 pounds, giving a total seeding of 30 pounds to the acre.

For the coastal-plain section, permanent pasture-grass mixtures are as follows: Orchard grass, 10 pounds; Bermuda grass roots; white clover, 4 pounds; and Japan clover (rough) 12 pounds, making a total seeding of 26 pounds to the acre. Another grass mixture is redtop, 8 pounds; tall oatgrass, 7 pounds; perennial ryegrass, 7 pounds; mammoth clover, 5 pounds; and white clover, 3 pounds, totaling 30 pounds of seed an acre.

Carefully conducted field experiments have been made by the North Carolina Agricultural Experiment Station on many types of soils in the State to determine the best fertilizer treatment for different crops. Table 5 gives recommendations for the use of fertilizers.

TABLE 5.—*Recommendations for the use of fertilizers for the principal crops on soils in Lee County, North Carolina*

Soil	Fertilizers[1] recommended for—						
	Corn	Cotton	Tobacco	Small grains	Legumes	Early potatoes	Sweet-potatoes
Norfolk, Marlboro, Ruston, Hoffman, Chesterfield	*Pounds* 300 to 400 of 4–8–4 and top dressing of 75 to 100 of nitrate of soda when corn is knee high.	*Pounds* 500 to 600 of 4–8–4 and top dressing of 75 to 100 of nitrate of soda.	*Pounds* 800 to 1,000 of 3–8–6.	*Pounds* -----	*Pounds* 300 of 2–8–4	*Pounds* 1,600 to 2,000 of 5–7–5.	*Pounds* 800 of 3–8–8.
Cecil, Georgeville, Wadesboro, Davidson	300 of 4–10–4	500 to 600 of 4–10–4	700 to 800 of 3–10–6.	300 of 4–10–4	300 of 2–10–4	-----	700 of 3–8–8.
Alamance, Granville, White Store	300 of 4–10–4 and top dressing of 75 to 100 of nitrate of soda.	500 of 4–10–4 and top dressing of 75 to 100 of nitrate of soda.	----do-----	300 of 4–10–4 and top dressing of 75 to 100 of nitrate of soda.	----do-----	-----	750 of 3–8–8.
Wickham, Altavista, Roanoke	300 of 4–8–4	500 of 4–8–4	-----	300 of 4–8–4	200 to 300 of 2–8–4.	-----	-----

[1] Quantities given are acre applications.

The fertilizer for tobacco should contain materials of the following proportions and sources: Two percent of the nitrogen should be derived from inorganic materials and 2 percent from organic materials; 2 percent of the potash should be derived from muriate of potash and 4 percent from high-grade sulphate of potash or, preferably, sulphate of potash and magnesia.

Table 6 lists the highest yielding varieties and strains of the leading crops grown in the piedmont-plateau and coastal-plain sections.

TABLE 6.—*Crop varieties recommended for the piedmont-plateau and coastal-plain sections of Lee County, N. C.*

Crop	Piedmont-plateau section	Coastal-plain section	Crop	Piedmont-plateau section	Coastal-plain section
Corn	Weekly Improved (Piedmont branch station strain), Southern Beauty, Latham Double, Jarvis Golden Prolific (yellow), Cocke Prolific, Biggs.	Latham Double, Cocke Prolific, Highland Horsetooth, Indian Chief (yellow), Jarvis Golden Prolific (yellow), Biggs.	Tobacco	Bonanza, Cash, Whitestem Orinoco, Jamaica (wrapper).	Bonanza, Cash, Whitestem Orinoco, Jamaica (wrapper).
			Cotton	Mexican Big Boll, Cleveland Big Boll, Coker-Cleveland (1 1/16-inch staple).	Mexican Big Boll, Cleveland Big Boll, Coker-Cleveland (1 1/16-inch staple).
Wheat	Fulcaster (Pennsylvania station strain), Purple Straw, Leap Prolific, Red Heart.		Sorgo	Honey or Japanese Seed Ribbon, Red Amber, Sugar Drip, Gooseneck.	Honey or Japanese Seed Ribbon, Red Amber, Gooseneck.
Rye	Abruzzi	Abruzzi.	Grasses	Orchard, redtop, timothy, tall oatgrass, Kentucky bluegrass, meadow fescue.	Redtop, Bermuda, ryegrass, carpet, Dallis, bluegrass.
Oats	Lee, Fulghum, Appler, Norton, Coker 32-1.	Fulghum (for fall sowing), Appler, Burt (for spring sowing).			
Barley	Tennessee No. 6 (hooded).	Tennessee No. 6 (hooded).	Soybeans (for seed).	Laredo, Herman, Virginia.	Laredo, Herman, Mammoth Yellow, Tokyo, Biloxi, Otootan.
Cowpeas (for seed).	Groit, Early Red, Whippoorwill.	Groit, Whippoorwill, Brabham.			
Cowpeas (for hay).	Wonderful, Monetta, Groit.	Brabham, Iron, Black.	Soybeans (for soil improvement).	Herman, Virginia, Mammoth Yellow, Tokyo, Laredo.	Herman, Mammoth Yellow, Tokyo, Mammoth Brown, Otootan.
Clovers and vetch.	Red, white, crimson, and Japan clover (lespedeza); sweetclover; hairy vetch.	Crimson, white, and Japan clover (lespedeza); sweetclover; hairy vetch.	Soybeans (for hay).	Laredo, Virginia, Herman.	Laredo, Otootan, Tokyo, Herman, Mammoth Yellow.
Peanuts		Virginia Bunch, Virginia Runner, Spanish, North Carolina.	Velvetbeans		Early Speckled, Osceola.

Following is a list of bulletins and circulars which will give further information concerning crops and soil improvement. This list is furnished by the North Carolina State College, Raleigh, N. C.

North Carolina State Department of Agriculture Agronomy Information Circulars 11, Results of Soil Building Demonstrations in North Carolina; 47, Improved Practices for Producing Tobacco of Better Quality; 48, How Farmers of the State May Have Their Soils Examined and Appraised; 51, How the North Carolina Soil Survey is Being Used to Help Farmers; 68, The Part Legumes Play in Maintaining the Productiveness of North Carolina Soils; 72, Tobacco Fertilizer Recommendations for 1933; and 73, Crop Rotation as a Material Aid to Soil Productiveness.

North Carolina Agricultural Experiment Station Circular 9, Grass Mixtures for North Carolina Pastures.

North Carolina Agricultural Experiment Station Bulletin 261, Value of Lime on Cecil Clay Loam Soil.

North Carolina Agricultural College Extension Circulars 127, Soybean Growing in North Carolina; 173, Terracing Farm Lands; and 178, Winter Legumes for Soil Improvement.

North Carolina Agricultural College Extension Folders 8, Tobacco Plant Beds; 9, Growing Quality Tobacco; and 28, Building Permanent Pastures in Piedmont, North Carolina.

SOILS AND THEIR INTERPRETATION

Lee County is in the Red and Yellow soils region of the United States. The surface soils are predominantly light in color, ranging from light gray to reddish brown, and they range in texture from sandy loam to clay loam. The soils may be divided into two broad groups—the light sandy soils of the southern part, or coastal-plain section, and the heavy soils of the northern part, or piedmont-plateau section which covers about three-fifths of the county.

All the soils have developed under forest cover and, as the trees provided only a small amount of vegetable material, very little organic matter accumulated. The native forest growth on the soils of the piedmont-plateau section consisted principally of deciduous trees, together with a few shortleaf pines and cedars; and that on the soils of the coastal-plain section was chiefly longleaf pine, and a few scrub oaks. In forested areas a thin covering of forest debris and leafmold is present on the surface in most places, and in the topmost 2 or 3 inches of the surface soil a small amount of organic matter is mixed with the mineral particles.

The soils range from medium acid to strongly acid; that is, they have a pH value ranging from about 4.8 to 6. Table 7 gives the pH values of two soils. These determinations were made in the laboratories of the Bureau of Chemistry and Soils by the hydrogen-electrode method.

TABLE 7.—*pH determination of two soils from Lee County, N. C.*

Soil type and sample no.	Depth	pH	Soil type and sample no.	Depth	pH
Granville very fine sandy loam:	*Inches*		Wadesboro silt loam:	*Inches*	
238801	0- 1	5.5	238849	0 - ½	4.4
238802	1- 6	4.5	238850	½- 2½	4.5
238803	6-13	4.7	238851	2½- 7	4.9
238804	13-30	4.9	238852	7 -12	4.9
238805	30-42+	5.0	238853	12 -32	4.9
			238854	32 -45+	4.7

The effects of erosion, induced through incorrect land use, are evident in many parts of the county. In many places the surface soil has been removed, leaving the B horizon exposed. In other places gullies have formed down to the parent material or even to bedrock. In many places in cultivated fields, sheet erosion has uncovered the B horizon, giving the surface soil a spotted red and gray appearance. At present normally developed soils occur only on the smoothest relief and gentle slopes which have been protected by forest.

All the soils of the uplands of the piedmont-plateau section have developed from weathered material of the underlying rocks and those of the coastal-plain section from unconsolidated sands and sandy clays. The line dividing the piedmont-plateau and coastal-plain sections begins near Center Church on the Moore County line and extends across the county in a northeasterly direction near Jonesboro and Baptist Chapel to the Harnett County line.

The geological formations of the county may be placed in three divisions: (1) Triassic sandstone, shale, and mudstone; (2) Carolina slates, crystalline schist and granitic rocks; and (3) unconsolidated sands and sandy clays of the Lafayette formation. The rock formations of divisions 1 and 2 underlie about one-half of the county. The Triassic formations are in the northern and western parts; the Carolina slates are developed in a narrow strip along the northern part; and the crystalline schist and granitic formation begins as a narrow belt near Sanford and becomes much wider near the Harnett County line in the northeastern part.

In the first division, the decomposed material of the underlying sandstone, shale, and mudstone, through soil-forming processes, has given rise to the Wadesboro, Granville, and White Store soils. In the second division, the Carolina slates have given rise to Georgeville and Alamance soils and the crystalline schist and granitic formation to the Cecil soils. A few small areas of diorite and andesite are associated with these rocks, and decomposed materials of these have developed into Davidson soils.

The unconsolidated sand and sandy clay material of the coastal-plain section is sedimentary in origin and consists of piedmont-plateau soil and rock debris, which were transported by streams and deposited when the coastal-plain region was under water. The weathering of this formation and the subsequent soil-forming processes acting on the material have given rise to the Norfolk, Ruston, Marlboro, and Hoffman soils in this county. On the boundary between the two physiographic provinces, Bradley and Chesterfield soils have developed from material of both provinces, the A horizons being from coastal-plain material and the B and C horizons from piedmont-plateau material developed in place.

The soils of the first and second bottoms along the streams are composed of reworked material brought down by the streams from the uplands and deposited in the valleys. They are included in the Wickham, Altavista, and Roanoke series; and those in the first bottoms are designated as Congaree soil and meadow.

In respect to color, drainage, aeration, and oxidation, two large groups of soils occupy most of the piedmont-plateau section, namely, the normally developed soils and the less mature soils. The greater part of the soils of this section have been classed in the Wadesboro, Georgeville, Granville, and Alamance series. The Wadesboro and Georgeville soils constitute the normally or maturely developed soils and may be considered the soils which express the normal result of the climate acting on weathered geological material. They are mature podzolic soils having an eluviated A horizon and an illuviated B horizon.

The Granville and Alamance soils, as regards oxidation, aeration, and drainage, are less mature than the Wadesboro and Georgeville

soils, but they have fairly well developed profiles. These soils in general occupy flat interstream areas, but in places they are developed on gentle slopes. Internal drainage and aeration are not so thorough as in the mature Wadesboro and Georgeville soils, and, therefore, oxidation is not so complete. The surface horizon of these soils is gray or nearly white.

In the gray sandy soils of the coastal-plain section, Norfolk sandy loam represents the normally developed mature soil. It has a gray A horizon, a yellow B horizon, and a mottled C horizon of friable sandy clay material.

A description of a profile of Wadesboro silt loam, typical of the Red soils, as observed 2½ miles west of Sanford in the piedmont-plateau section follows:

A_0 and A_1. 0 to ½ inch, dark-gray organic matter consisting of decayed leaves and twigs, mixed with the mineral material.

A_2. ½ to 2½ inches, gray silt loam with a noticeable content of very fine sand.

A_3. 2½ to 7 inches, grayish-yellow silt loam containing a small quantity of very fine sand.

B_1. 7 to 12 inches, reddish-brown heavy but friable and crumbly silty clay of coarse-granular to fine-nut structure, which, with slight pressure, breaks into irregular soil particles ranging in diameter from about one-sixteenth to one-half inch. The color on the insides of the particles is the same as that on the outsides. A few plant roots are in this layer, most of which extend horizontally. The heaviness of the B horizon apparently causes the roots to run parallel to the horizon.

B_2. 12 to 32 inches, Indian-red heavy clay which is slightly heavier than the material in the B_1 horizon but is still friable and crumbly. The outsides of the soil particles are rather smooth and a little darker than the insides. A few roots follow drainage or breakage lines. This is the layer of greatest concentration. The heavy texture and structure of the B_1 and B_2 horizons bear evidence of the advanced stage of development of soils in this region. The heavy condition is due to the deposition of fine soil material carried down from above by surface water; hence the percentage of fine material is greater than in the A horizon. These are the lowest horizons in which weathering and oxidation of the soil material are approximately complete.

C. 32 to 45 inches, soft decomposed Indian-red or purplish-red shale or mudstone. The material is friable silty clay loam which retains the original structure and color of the rock.

Cecil fine sandy loam differs from Wadesboro silt loam mainly in the texture of the surface soil and in the source of soil material. The A horizon is grayish yellow, and the B horizon is bright-red heavy clay containing a few flakes of mica. The underlying soil material, or C horizon, consists of decomposed granite or crystalline schists.

Georgeville gravelly silt loam differs from the Wadesboro soil mainly in its chemical composition and in the material from which it is derived. In Georgeville gravelly silt loam the A horizon is light gray, the B horizon is red heavy but crumbly clay to a greater depth than the corresponding horizon in Wadesboro silt loam, and the C horizon consists of smooth soft decomposed slate of the Carolina slate belt.

The Davidson soil differs from the Wadesboro soil in the character of the soil material and in chemical composition. This soil has developed from the weathered products of dark igneous rocks, mainly diorite and andesite; and chemical analyses indicate that it has a higher lime content than the Wadesboro soil. The surface horizon

is dark-brown or reddish-brown clay loam, and the B horizon, or layer of greatest concentration, is maroon or dark-red heavy crumbly clay. This soil has a much deeper B horizon than any other soil of the piedmont-plateau section.

The Granville and Alamance soils on the uplands and the Altavista soils on the second bottoms, or terraces, have gray or light-gray A horizons and yellow fairly friable B horizons. These soils differ from each other mainly in that the Granville soil has developed from decomposed Triassic sandstone and shale formations, the Alamance from the Carolina slates, and the Altavista from alluvial deposits of piedmont-plateau origin.

Norfolk sandy loam represents the maturely developed Yellow soil of the coastal-plain section of the county. A detailed description of a profile of this soil, as observed at Grace Chapel, follows:

A_1. 0 to 5 inches, brownish-gray sandy loam of single-grain structure.

A_2. 5 to 18 inches, yellow loamy sand or sandy loam, containing enough clay to hold together when squeezed in the hand. The soil material is very friable.

B. 18 to 40 inches, yellow friable sandy clay which is uniform in color and without definite structure. It readily crumbles to a friable mealy mass.

C. 40 to 60 inches, the parent material of unconsolidated sand, sandy clay, and clay, streaked and mottled light gray, yellow, and red. The light-gray material is generally heavy and sticky, and the red material is more friable than the gray.

The Ruston soils differ from the Norfolk mainly in the color of the B horizon which is yellowish red or reddish yellow instead of yellow. The red color probably indicates that the iron salts in this soil are in a more advanced stage of oxidation than those in the Norfolk soils. The Wickham soils, developed on terraces, are similar in profile to the Ruston soils, but they differ in the source of material.

Marlboro sandy loam is somewhat similar in profile development to Norfolk sandy loam, but the A horizon is not so thick as in the Norfolk soil, and the color has a brown hue. The B horizon is deep-yellow or very light brownish-yellow sticky but friable sandy clay which probably contains slightly more colloidal material than the Norfolk soil.

Bradley sandy loam has a gray sandy A horizon and a friable red clay B horizon. Chesterfield sandy loam has a gray A horizon and a yellow friable B horizon. The upper part of the B horizon of the Chesterfield soil is composed of coastal-plain material and the lower part is piedmont-plateau material similar to the material in the B horizons of the Alamance and Granville soils.

In addition to the normal or mature soils, several soils may be grouped as immature, or young, in stage of development. Included in this group are White Store silt loam, Hoffman sandy loam, Guin soils, undifferentiated, Roanoke silt loam, Congaree silt loam, and meadow.

White Store silt loam has developed from material of Triassic shale and mudstone and is probably the least mature soil on the uplands. The A horizon is grayish yellow friable, and similar to the A horizon of the Granville soils. A distinctly developed B horizon is lacking, and the C horizon consists of Indian-red heavy plastic decomposed rock material which in most places is mottled or streaked with yellow, blue, and purple.

The A horizon of Hoffman sandy loam is grayish-yellow light friable sandy loam. In most places this horizon directly overlies the C horizon which consists of mottled red, pink, yellow, and gray hard sticky sandy clay material.

Guin soils, undifferentiated, have no development of a profile. They include stony and gravelly areas having strongly rolling, hilly, and broken relief.

The A_1 horizon of Roanoke silt loam is dark gray and is from 2 to 4 inches thick. The A_2 horizon is gray silt loam. The B horizon consists of mottled yellow and gray heavy plastic clay. This soil is developed on second bottoms, or terraces, and it is immature mainly because of inadequate drainage throughout.

Congaree silt loam and meadow occupy positions on first bottoms. These soils have been formed from deposits of soil material washed from the uplands and deposited along streams. The material is recent in age, and new material is continually being added to the soils. Because of inadequate drainage and the recent age of the material, these soils have not developed definite profiles.

○

Accessibility Statement

This document is not accessible by screen-reader software. The U.S. Department of Agriculture is committed to making its electronic and information technologies accessible to individuals with disabilities by meeting or exceeding the requirements of Section 508 of the Rehabilitation Act (29 U.S.C. 794d), as amended in 1998. Section 508 is a federal law that requires agencies to provide individuals with disabilities equal access to electronic information and data comparable to those who do not have disabilities, unless an undue burden would be imposed on the agency. The Section 508 standards are the technical requirements and criteria that are used to measure conformance within this law. More information on Section 508 and the technical standards can be found at www.section508.gov.

If you require assistance or wish to report an issue related to the accessibility of any content on this website, please email Section508@oc.usda.gov. If applicable, please include the web address or URL and the specific problems you have encountered. You may also contact a representative from the USDA Section 508 Coordination Team.

Nondiscrimination Statement

In accordance with Federal civil rights law and U.S. Department of Agriculture (USDA) civil rights regulations and policies, the USDA, its Agencies, offices, and employees, and institutions participating in or administering USDA programs are prohibited from discriminating based on race, color, national origin, religion, sex, gender identity (including gender expression), sexual orientation, disability, age, marital status, family/parental status, income derived from a public assistance program, political beliefs, or reprisal or retaliation for prior civil rights activity, in any program or activity conducted or funded by USDA (not all bases apply to all programs). Remedies and complaint filing deadlines vary by program or incident.

Persons with disabilities who require alternative means of communication for program information (e.g., Braille, large print, audiotape, American Sign Language, etc.) should contact the responsible Agency or USDA's TARGET Center at (202) 720-2600 (voice and TTY) or contact USDA through the

Federal Relay Service at (800) 877-8339. Additionally, program information may be made available in languages other than English.

To file a program discrimination complaint, complete the USDA Program Discrimination Complaint Form, AD-3027, found online at http://www.ascr.usda.gov/complaint_filing_cust.html and at any USDA office or write a letter addressed to USDA and provide in the letter all of the information requested in the form. To request a copy of the complaint form, call (866) 632-9992. Submit your completed form or letter to USDA by:

(1) mail: U.S. Department of Agriculture
Office of the Assistant Secretary for Civil Rights
1400 Independence Avenue, SW
Washington, D.C. 20250-9410;

(2) fax: (202) 690-7442; or

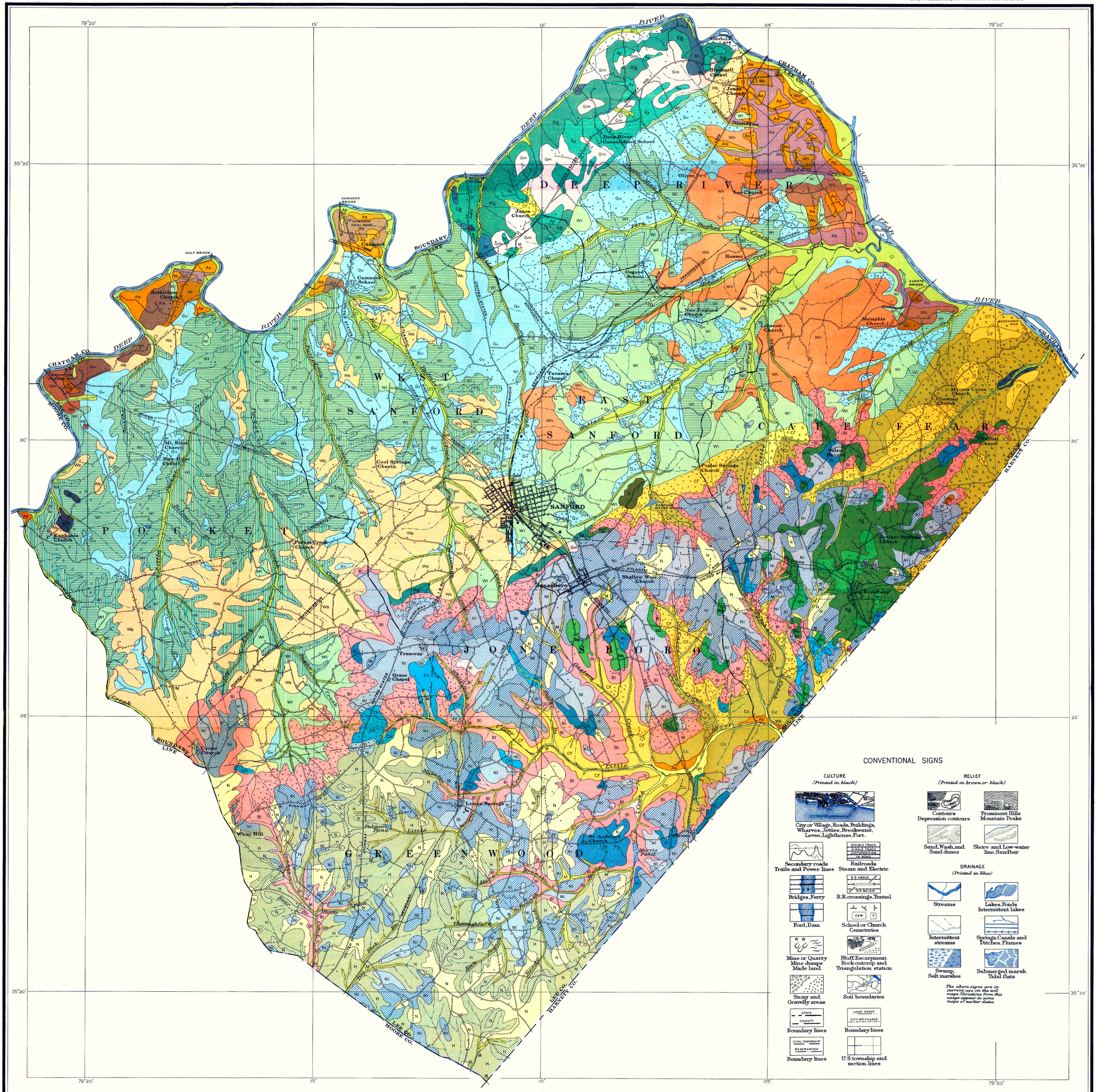
(3) email: program.intake@usda.gov.

USDA is an equal opportunity provider, employer, and lender.

U. S. DEPARTMENT OF AGRICULTURE
BUREAU OF CHEMISTRY AND SOILS
HENRY G. KNIGHT, CHIEF
CHARLES E. KELLOGG, IN CHARGE SOIL SURVEY

SOIL MAP
LEE COUNTY
NORTH CAROLINA

NORTH CAROLINA DEPARTMENT OF AGRICULTURE
W. A. GRAHAM, COMMISSIONER
NORTH CAROLINA AGRICULTURAL EXPERIMENT STATION
R. Y. WINTERS, DIRECTOR
C. B. WILLIAMS, IN CHARGE SOIL SURVEY



LEGEND

- Alamance gravelly silt loam — Ay
- Hoffman sandy loam — H
- Altavista very fine sandy loam — As
- Marlboro sandy loam — Ma
- High-terrace phase — As
- Norfolk sand — N
- Bradley sandy loam — Bl
- Hilly phase — N
- Gravelly phase — Bl
- Norfolk sandy loam — Nl
- Cecil fine sandy loam — Cf
- Deep phase — Nl
- Gravelly phase — Cf
- Gravelly phase — Nl
- Stony phase — Cf
- Roanoke silt loam — Rk
- Cecil clay loam — Cc
- Ruston gravelly sandy loam — Rg
- Stony phase — Cc
- Ruston sandy loam, Deep phase — R
- Chesterfield sandy loam — Ch
- Wadesboro gravelly silt loam — Wl
- Gravelly phase — Ch
- Mixed phase — Wl
- Congaree silt loam — Cr
- Eroded phase — W
- Davidson clay loam — Dl
- Wadesboro silt loam — Ws
- Georgeville gravelly silt loam — Gm
- White Store silt loam — Wh
- Georgeville gravelly silty clay loam — Gg
- Wickham sandy loam — Wk
- Granville very fine sandy loam — Gv
- High-terrace phase — Wk
- Gravelly phase — Gv
- Wickham very fine sandy loam — Wv
- Guin soils (*Undifferentiated*) — G
- Meadow — M
- Rock outcrop

CONVENTIONAL SIGNS

CULTURE *(Printed in black)*

- City or Village, Roads, Buildings, Wharves, Jetties, Breakwater, Levee, Lighthouse, Fort.
- Secondary roads, Trails and Power lines
- Railroads, Steam and Electric
- Bridges, Ferry
- R.R. crossings, Tunnel
- Ford, Dam
- School or Church, Cemeteries
- Mine or Quarry, Mine dumps, Made land
- Bluff, Escarpment, Rock outcrop and Triangulation station
- Stony and Gravelly areas
- Soil boundaries
- Boundary lines
- Boundary lines
- Boundary lines
- U.S. township and section lines

RELIEF *(Printed in brown or black)*

- Contours, Depression contours
- Prominent Hills, Mountain Peaks
- Sand, Wash, and Sand dunes
- Shore and Low-water line, Sandbar

DRAINAGE *(Printed in blue)*

- Streams
- Lakes, Ponds, Intermittent lakes
- Intermittent streams
- Springs, Canals and Ditches, Flumes
- Swamp, Salt marshes
- Submerged marsh, Tidal flats

The above signs are in current use on the soil maps. Variations from this usage appear in some maps of earlier dates.

W. Edward Hearn, Inspector, District 2.
Soils surveyed by S. O. Perkins, U. S. Department of Agriculture, in charge, and E. F. Goldston, North Carolina Department of Agriculture and North Carolina Agricultural Experiment Station.

1 ½ 0 1 2 3 4 Miles
Scale 1 inch = 1 mile

Lith. A. Hoen & Co., Inc.

Field Operations
Bureau of Chemistry and Soils
1933